l Library

FEB 1 5 1946

VOLUME 42 NUMBER 5

ARCHIVES OF

OTOLARYNGOLOGY

EDITORIAL BOARD

GEORGE M. COATES, Chief Editor
1721 Pine Street, Philadelphia 3

ISIDORE FRIESNER, New York (Deceased) CHEVALIER JACKSON, Philadelphia
RALPH A. FENTON, Portland, Ore. ROBERT L. GOODALE, Boston
ERNEST M. SEYDELL, Wichita, Kan. J. MACKENZIE BROWN, Los Angeles
CARL H. McCASKEY, Indianapolis

NOVEMBER-DECEMBER 1945

PUBLISHED MONTHLY BY AMERICAN MEDICAL ASSOCIATION, 535 NORTH DEARBORN STREET, CHICAGO 10, ILLINOIS. ANNUAL SUBSCRIPTION, $6.00

Entered as Second Class Matter Jan. 14, 1925, at the Postoffice at Chicago, Under the Act of Congress of March 3, 1879

COPYRIGHT, 1946, BY THE AMERICAN MEDICAL ASSOCIATION

NOTE

Owing to a strike of printers in the press of the American Medical Association, publication of all of the special periodicals of the Association has been considerably delayed. In order to bring these periodicals up to the normal schedule, the November and December numbers are combined into a single issue. Regular publication will be resumed with the issues for January 1946.

MANAGING EDITOR.

ARCHIVES OF OTOLARYNGOLOGY

ME 42 NOVEMBER-DECEMBER 1945 NUMBER 5

COPYRIGHT, 1946, BY THE AMERICAN MEDICAL ASSOCIATION

HERPES ZOSTER AURIS ("GENICULATE" GANGLIONITIS)

REPORT OF EIGHT CASES WITH PHOTOGRAPHS OF THE SO-CALLED SYNDROME OF RAMSAY HUNT

HUGH O'NEILL, M.D.

SANTA ANA, CALIF.

INTRODUCTION

many papers, from 1906 to 1910, Ramsay t[1] reviewed 56 cases, abstracted from the ature, including 4 observed by him, of her- eruptive inflammations of zona involving ear, fusing the herpetic variants in these into an entity which he called geniculate glionitis. This entity with its corollary, genic- neuralgia, has received only quasirecog- in in otolaryngologic texts. As a measure of actual skepticism existent, neurosurgeons ate for glossopharyngeal otalgia but appar- are unable to find cases of geniculate algia, while a search for factual information "Hunt's syndrome" in textbooks brings out ly the extreme paucity of information con- ing this most interesting neuro-otologic dis- An English textbook, for example, states, rpes Zoster Auris is a rare disease," follow- this laconic quip with a meager discussion Hunt's work, while an American text, after itically discussing, in two small paragraphs, nt's Syndrome," displays an excellent col- representation of a "zoster ear" but one out any accompanying facial paralysis and refers the reader for otologic enlightenment Hunt's papers, which are naturally all too con- ing. Certain it is that the entity which Hunt labored so strenuously to establish has received in the past forty years a minimum of pathologic support. The Harvard group of Denny-Brown, Adams and Fitzgerald,[2] in a recent study of spinal zoster and of "geniculate" ganglionitis, supported by a veritable mine of neuropathologic information, made a telling attack on the validity of Hunt's hypothesis. They specifically condemned the buttressing of Hunt's assumptions with such pathologic support as that offered by Maybaum and Druss,[3] whose case from either the clinical or the pathologic standpoint falls doubtfully within the admittedly elastic confines of what Hunt called "geniculate" ganglionitis.

It has been assumed, incorrectly, that aural herpes zoster, with or without facial paralysis, is a rare disease. Rather it is one that is rarely recognized. The majority of the patients are seen by physicians in general practice and the condition is constantly misdiagnosed as eczema, a stroke or Bell's palsy, and the rarity is more apparent than real. With this in mind and in view of the difficulty of access to critical statements concerning the "geniculate" syndrome, Hunt's conceptions of "geniculate" ganglionitis have herein been reviewed in the light of 8 cases of herpes zoster auris, with and without neurologic complications, in which photographs of the patients can be shown.

1. This case is one of the earliest from the point of view of the age of occurrence to be recorded in the literature. The patient was an infant of 6 months.

2. In this instance a herpetic chimera of multiple ganglionitis occurred in a middle aged man.

3. This case is a prima facie clinical denial of Hunt's geniculate ganglion thesis.

4. This instance of multiple ganglionitis with total trigeminal involvement, keratitis profunda and optic neuritis has been reported elsewhere in detail.

5. This case is one of an "expanded geniculate" type of cervical ganglionitis.

Hunt, J. R.: (*a*) Herpetic Inflammations of the culate Ganglion: A New Syndrome and Its Aural plications, Arch. Otol. **36**:371, 1907; (*b*) On Her- Inflammation of the Geniculate Ganglion: A New rome and Its Complications, J. Nerv. & Ment. **34**:73, 1907; (*c*) Otalgia Considered as an Affec- of the Sensory System of the Seventh Cranial e, Arch. Otol. **36**:6, 1907; (*d*) The Paralytic plications of Herpes Zoster of the Cephalic Ex- ity, J. A. M. A. **53**:1456 (Oct. 30) 1909; (*e*) rther Contribution to the Herpetic Inflammations of Geniculate Ganglion, Am. J. M. Sc. **136**:226, 1908; Symptom-Complex of the Acute Posterior Polio- itis of the Geniculate, Auditory, Glossopharyngeal Pneumogastric Ganglia, Arch. Int. Med. **5**:631 e) 1910; (*g*) The Sensory Field of the Facial ve: A Further Contribution to the Symptomatology e Geniculate Ganglion, Brain **38**:446, 1915; (*h*) culate Neuralgia (Neuralgia of the Nervus Faci- , Arch. Neurol. & Psychiat. **37**:253 (Feb.) 1937.

2. Denny-Brown, D.; Adams, R. D., and Fitzgerald, P. J.: Pathologic Features of Herpes Zoster: A Note on "Geniculate Herpes," Arch. Neurol. & Psychiat. **51**:216 (March) 1944.

3. Maybaum, J. L., and Druss, J. G.: Geniculate Ganglionitis (Hunt's Syndrome): Clinical Features and Histopathology, Arch. Otolaryng. **19**:574 (May) 1934.

6. The sixth case is one of second and third cervical ganglionitis with involvement of the second and third gasserian ganglions, without facial paralysis but with aural herpes. It is not a case of "geniculate" involvement but is an example of an overlapping second cervical and gasserian ganglionitis.

7. In this case "facial" and aural herpes embraced the postauricular area and the cleft (Hunt's "expanded geniculate zone") without facial paralysis. Two weeks after the primary attack the patient suffered a second vesiculation in the dermatome of the second cervical ganglion with accompanying facial weakness!

8. The patient was a 65 year old woman with second and third cervical ganglionitis, ophthalmic herpes and a regenerated type of facial paralysis with ipsilateral facial contractures and abnormal associated movements.

In addition, to avoid mere slavish adherence to anatomic concepts unacceptable to Mills [4] and other premier neurologists of Hunt's day, the 3 cases in the literature in which there had been an attempted pathologic investigation of the geniculate ganglion at necropsy are also summarized for what they offer in proof or disproof of Hunt's contentions. In the contemporary quasiacceptance of Hunt's views the tenuous basis for his ideas and the employment of many embryologic assumptions to support his thesis have been either unrecognized or accepted without argument by some otolaryngologists, whereas the truth is that the case for "geniculate" herpes, with its arresting mellifluous eponymic nomenclature, has rested for forty years on little foundation in clinical or neuropathologic fact. It is a truism voiced by the erudite Spiller that Hunt's thesis is almost incapable of proof and is likewise difficult of gainsaying!

THE SO-CALLED GENICULATE SYNDROME

In 1908, in what was evidently his final position for some years, Hunt [1c] stated that he was fusing into one syndrome those previously known herpetic eruptions, herpes occipitocollaris, herpes auricularis, and herpes auricularis with or without facial palsy accompanied by hearing loss or aural vertigo or both. These entities he attributed to an acute posterior poliomyelitis of the geniculate ganglion of the facial nerve, due to a primary, independent, idiopathic virus infection, and he asserted that the concomitant neurologic complications when present were due to an extension of the virus, producing inflammation of the adjacent seventh and eighth cranial nerves. The cutaneous herpes zoster zone for the geniculate ganglion he stated (without pathologic proof) was intercalated on the anterior aspect of the ear between the zone of the gasserian ganglion in front and the zone of the cervical ganglion behind. Previously, an anginal herpetiform eruption on the anterior half of the auricle had been considered of trigeminal origin, while vesiculation of the posterior half of the auricle was stated to be due to second cervical ganglionitis. To Hunt the "geniculate" feature of cephalic herpes became its Ultima Thule. He considered the inconstant accompanying facial paralysis to be due to h inflammation of, in Head's terminology, acute po poliomyelitis of the geniculate ganglion, constric it is, in an osseous canal.

Although Head and Campbell [5] had stated th essential pathologic changes of spinal herpes zoste limited to a single ganglion, corresponding to th of eruption, Hunt rightly asserted that two ganglions might be affected together and that cli this could occur most naturally in the case of the third and fourth cervical ganglions. He [1b] stated (without pathologic proof) that clinical evidence as neuritis in adjacent nerves, showed that pa ganglions might be implicated in "zona," a d frequently invoked by him to explain cases whi not conform to his scheme. He postulated a involvement of one spinal type ganglion as an e focus with the infection spreading to a serial ch ganglions, thus explaining the reports of early of fifth nerve sensory symptoms accompanying herpes, which he considered as being due to a fr ally localized inflammatory reaction in the ga ganglion of insufficient severity to produce an er It is by such types of clinical deduction that the e ear has become an area of herpetiform romance.

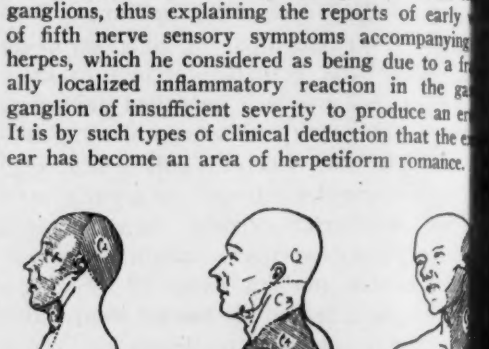


Fig. 1.—Diagrams of the dermatomes of th geminal and cervical nerves from Brock.[11] The tomoses of the cervical nerves with the seventh (facial) nerve, the known innervation of the e ear by the fifth, seventh, ninth, tenth and secon vical ganglions, combined with the present co ignorance of the manner in which the herpetic enters the nervous system, make the pinpoint aural herpetic lesions as being due solely to on of the five sensory innervations of the extern an anatomic folly.

A report of Hedinger was used by Hunt [1] to b this concept of multiple ganglionitis. Hedinge noted at necropsy in a case of spinal herpes th specific toxin of herpes zoster had produced cha serial rows of ganglions, ranging from hemor inflammation in the main "eruptive" ganglion milder fractionated type of inflammation in adj ganglions, and Hunt,[1c] to establish further the h involvement of multiple ganglionitis, suggested th virus had an affinity for unipolar spinal gan including under this classification those cranial s ganglions whose embryonic origin was the neural i. e., the gasserian, geniculate, acoustic, glossophary vagus and second, third and fourth cervical gan These, he held, represented a continuous gan series or chain of the same embryonal origin, and the realm of posterior poliomyelitis. He oppos neuritic theory of herpes zoster, i. e., that aural zoster was a neuritis of the auriculotemporal bra

4. Mills, C. K.: The Sensory Functions Attributed to the Seventh Nerve, J. Nerv. & Ment. Dis. **37**:273 and 355, 1910.

5. Head, H., and Campbell, A. W.: The Pat of Herpes Zoster and Its Bearing on Sensory Lo tion, Brain **23**:353, 1900.

fifth cranial nerve, and denied the validity of the ionic theory if it situated the eruptive lesion in emilunar ganglion of Gasser. He asserted that the ulate ganglion was the eruptive ganglionic site of s zoster auricularis and that the "geniculate" area aced the tympanic membrane, the external auditory and meatus, the concha, the tragus, the antitragus, be of the ear, the anthelix and the fossa of the lix. This was his original zone, but Hunt later [1b] ded the cleft between the auricle and the scalp, ed by Arnold's nerve, as being within the somatic y field of the seventh nerve, stating that a phylo-ically regressive remnant of innervation persists in aneous strip on the posteromesial surface of the e, within the buccal cavity in the area of distri-n of the chorda tympani nerve and on the palate the anterior pillar of the fauces. He pleaded that iscussion of the sensory distribution of the seventh l nerve must allow for some wandering of fibers, mparative embryologic grounds, and he thus ex-d those cases of herpetiform zoster in which the ve zone was clearly not within that circumscribed or zone of sensory distribution of the geniculate ion which he had described in his earlier papers. e wandering geniculate fibers, trespassing in the considered by neurologists to be a part of a cer-dermatome, were regarded by Hunt as representing avistic, regressive and vestigial innervation in the and the ear, and he thought that this trespassing ined those cases of herpes zoster auris which were icated by coexisting herpes of the palate; in short, anded the original geniculate aural zone to include ea delimited only by the wanderings of these re-ve fibers.

Hunt the ear is a vestigial, regressive organ. utaneous zones for the ninth and tenth ganglions, ll as for the seventh ganglion, therefore, are not y determined, and he considered that the seventh sensory innervation in man is phylogenetically ssive, supporting this view by the fact that in some forms of life the sensory system of the facial originally domiciled in the branchial cleft, ex-d or equaled its motor function.

him this regression of sensory function in favor tor function, with the retreat of the seventh sen-system before the overlapping and advancing fifth l nerve system anteriorly, and the overlapping of nsory cervical nerves posteriorly, are an embryo-reality. From this phylogenetic standpoint he d that the geniculate ganglion as the former sole rator of the branchial cleft retains today in many a remnant of its former sensory function within ccal cavity, not only in the region of distribution chorda tympani nerve but also in the soft palate. variable atavistic and regressive seventh sensory ation is older than the innervation of the ninth nth cranial nerves in intraoral representation, and receded before the advance of its two branchial sister innervators in the same manner as it has the fifth nerve. Therefore, on embryologic ds the alleged inconstant representation of the ulate ganglion in the buccal cavity, in the anterior sterior nares, on the posteromesial surface of the and on the adjacent mastoid area was used by to explain the cases in which herpes zoster with hout facial paralysis involved these areas. So far invalidating the geniculate ganglion thesis, Hunt ed, eruptions beyond the boundaries of his original rather supported it, a facile and convenient expla-. He incorrectly stated that isolated herpes occur-in what he called the expanded geniculate zone without facial paralysis was rare, and he argued illogically that if the ninth and tenth sensory ganglions were involved, instead of the seventh (geniculate), motor palsies of the pharynx and of the larynx rather than of the face should be expected. That Hunt's views have received general acceptance is untrue. Thirty years ago, when the controversy was in its initial stages, Mills,[4] of Philadelphia, took a position, from which he did not recede, that the sensory symptomatology of the seventh nerve was limited to taste. He would not admit the occurrence of herpes zoster of geniculate origin. He accepted and defended the traditional view that the eruption had its origin in the trigeminal, glossopharyngeal, vagus or cervical ganglions. If the geniculate ganglion was involved, argued Mills, disturbances of taste and facial palsy only, without aural herpes, would result, but if aural herpes was present, asserted Mills, involvement of one of the other ganglions, the fifth, the ninth, the tenth or the cervical, could be assumed.

Thirty-four years later, Denny-Brown, Adams and Fitzgerald,[2] if one accepts their clinical conclusions, had a unique opportunity to establish the validity of Mills' criticism, but regrettably failed to examine the ninth and tenth ganglions at necropsy, after carefully examining the geniculate and the cervical ganglions and finding that the former revealed no involvement while the latter showed necrosis due to an infarct. Lastly, in explaining the sometimes associated phenomena of motor paralysis of the face and aural vertigo (Ménière's syndrome), Hunt reiterated that the gasserian, geniculate, acoustic, glossopharyngeal, vagus and second, third and fourth cervical ganglions represented a continuous ganglionic series and that this serial chain of ganglions belonged to the realm of posterior poliomyelitis. There could thus be, on anatomic grounds, double, triple and bilateral forms of "zona" with eruptions in more than one "zoster zone." His interpretation of the posterior poliomyelitic process in the cranial sensory ganglions was that a hemorrhagic inflammation in one of these ganglions occurred, followed by eruptive herpetiform manifestations, and that, depending on the severity of the virus infection, other ganglions of the group became the seat of an inflammatory reaction which was not always of a sufficient degree to produce a zonal eruption. The manifestations of this milder involvement, he said, were neuritides and subjective sensory disturbances; for example, frequent vomiting and an irregular pulse would be signs of vagal involvement; he did not deny that these symptoms could represent a major rather than minor vagal involvement but asserted that in 35 cases abstracted from the literature he had not read of such a major vagal involvement. If hearing was affected without associated facial palsy, a primary involvement of the acoustic ganglion was to be postulated. As a corollary to the geniculate ganglionic localization of herpes, he insisted that postherpetic pain of the ganglion manifested itself as otalgia and was commonly overlooked.

His final position [1h] in 1937, somewhat modified from his earlier points of view, was that the large superficial petrosal nerve is an integral part of the geniculate visceral sensory system, while the small superficial and small deep petrosal nerves, whose sensory supply is from Jacobson's nerve (ninth), are not. He stated that the auricle is sensorily represented in the alleged geniculate zone by somatic sensory fibers from three cranial nerves, the seventh, the ninth and the tenth, and that, therefore, the neuralgias of all three nerves have confusing associated otalgias. The sensory elements of these nerves are the auricular branch of the vagus nerve, the auricular branch of the glossopharyngeal nerve and

geniculate cutaneous fibers via Arnold's nerve (the auricular branch of the vagus nerve) or the posterior auricular branch of the facial nerve. He asserted that "the former nerve [i. e., Arnold's nerve, the auricular branch of the vagus nerve] anastomoses with the facial nerve in the aqueduct of Fallopius and is then continued as a sensory branch of the external auditory canal and the posterior aspect of the auricle." He cited Testut and Latarjet as stating, in their "Traité d'anatomia Lumaino," that this sensory branch supplies sensation to . . . the concha, tragus, antitragus, lobule and anthelix, the external auditory canal and a portion of the tympanum.

The various otalgias were thus explained by Hunt[1e] as having a fourfold origin. The classic trifacial (fifth nerve) neuralgia derives its otalgia from involvement of the third division of the trigeminal nerve; "geniculate" neuralgia, with deep facial pain and otalgia, arises from the facial nerve; glossopharyngeal neuralgia was to Hunt primarily a disease of the tongue and the throat, with otalgia a minor symptom, one exaggerated by writers, he thought. Lastly he conceded that inferior laryngeal neuralgia of vagal origin can produce otalgia. Of these neuralgias Hunt stated, contrary to the opinions of others, that geniculate prosopalgia is clinically the most important. This syndrome he represented as deep-seated pain in the face, in the posterior orbital, nasal, malar and palatal regions, with associated otalgia and mastoidalgia, and called it "neuralgia facialis vera"! He[1e] asserted that its anatomic basis is the geniculate system, which is made up of: (1) sensory filaments to the internal ear and branches to the alleged herpes zoster zone of the auricle, which bring it into close relation with the auditory mechanism (these branches are responsible for the otalgia); (2) the sensory system of the great superficial petrosal nerve, which brings the geniculate ganglion into close relation with the orbital, nasal and palatal branches of the sphenopalatine ganglion and the maxillary division of the fifth nerve, these branches giving deep prosopalgia; (3) the viscero-sensory system, having various anastomoses with the fifth, ninth and tenth cranial nerves and the cervical plexus.

Hunt felt that, despite his contributions over a period of thirty years, postherpetic geniculate neuralgia was still unrecognized. For several types of otalgia in the depths of the ear within his preempted "geniculate" zone, he lamented, correctly, that not only were mastoidectomies wrongly done but that, even when the sense of taste was lost, due to involvement of the chorda tympani, his syndrome was misinterpreted as a tympanic plexus neuralgia, with resulting intracranial section of the glossopharyngeal nerve.

Parenthetically, in the literature one finds only 2 instances of section of the seventh nerve for "geniculate" otalgia, the famous case reported by Clark and Taylor[6] four decades ago and the latter day case of Furlow.[7]

In summary, then, Hunt's evidence for the alleged geniculate ganglion sensory innervation of the ear rests on deductions from his personal observation of a few cases and a review of the literature of "facial herpes" and of herpes zoster auris with and without facial paralysis, reenforced by deductions from surgical operative notes on the development of aural anes areas following gasserian ganglionectomies do Frazier, Cushing, Krause and others around the t the century which, owing to injuries of the su petrosal nerve in the earlier operations and to the s nature of the sections in the Spiller-Frazier technic in the nature of uncontrolled experiments.

Prior to Hunt's papers, seventh nerve inner was considered mainly of a motor nature with sensory taste functions. He enlarged the area of s sensory innervation by declaring that a gen sensory zone existed on and in the auricle, viz., a shaped area with the tympanum as its apex a concha and the adjacent marginal area on the ex surface of the auricle as its base. When reports o of aural herpes zoster with circumaural and juxta vesiculation forced him to retreat from his o concept, then, by assumptions from the field of co tive embryology, he enlarged the area of alleged g late ganglion innervation by including areas u considered as lying within the gasserian and c dermatomes, alleging that the vesiculations app outside his "primary" geniculate site were due to in ment of seventh nerve fibers wandering circuma and juxta-aurally in the gasserian and cervical d tomes, a concept which reduces formal anatomic k edge of the innervation of the ear and the scalp to

A just criticism of Hunt's work is that the d tologic aspects of the disease have received too attention, the neurologic history too little. One p with herpes zoster auris may complain of net pains in the ear, while others point to neuralgia area of the second cervical dermatome. I have se from cases of aural herpes zoster 8 cases in whi efflorescences were gargantuan and in which the s the neuralgia was not necessarily auricular, po owing to dermatomic overlap.

PATHOLOGIC EVIDENCE SUPPORTING T "RAMSAY HUNT SYNDROME"

There are three pathologic reports of alleged geni ganglionitis, based on necropsies, in the literature, of Hunt[1b] (1905), Maybaum and Druss[3] (1934 Denny-Brown, Adams and Fitzgerald[2] (1944). A tagonist for Hunt's thesis must admit that the p logic grounds for incriminating the geniculate ga in aural herpes zoster are almost nonexistent. Hu his sole case with necropsy (the patient was a 48 ye man dying eighty days after an attack of herpes oc cervicalis with facial paralysis but without aur herpes), found inflammatory changes in the tip third cervical ganglion, with a loss of nerve fibe with islets of sclerosis in the corresponding po root of the spinal cord; these could be traced throu first, the second and the third cervical segment evidences of myelin degeneration in that portion posterior column immediately adjacent to the po horn; the nerve of Wrisberg, the sensory root seventh nerve with its trophic center in the geni ganglion, showed the same extramedullary and medullary changes as were observed in the spina and in the posterior nerve root corresponding t third cervical ganglion.

True to the marplot atmosphere which has env studies of the geniculate ganglion in relation to herpes zoster, the ganglion itself was not remov Hunt; "unfortunately that portion of the facial removed and supposed to contain the intumes ganglio-formis consisted only of membrane so

6. Clark, L. P., and Taylor, A. S.: (*a*) True Tic Douloureux of the Sensory Filaments of the Facial Nerve, J. A. M. A. **53**:2144 (Dec. 25) 1909; (*b*) A Contribution to Our Knowledge of the Idiopathic Otalgias and Their Surgical Treatment, J. Nerv. & Ment. Dis. **37**:50, 1910.

7. Furlow, L. T.: Tic Douloureux of the Nervus Intermedius (So-Called Idiopathic Geniculate Neuralgia), J. A. M. A. **119**:255 (May 16) 1942.

in the geniculate ganglion cannot be given." ally Hunt [1b] proceeded: ". . . even in the absence geniculate ganglion the existence of well marked ration in the nerve of Wrisberg (pars intermedia eventh nerve) and its intrabulbar root is sufficient that this structure was involved." That the late ganglion may have been involved, no one insay, but loss of the ganglion eliminated either r disproof of involvement. Clinically the patient facial paralysis and cervical ganglionitis (veri- necropsy) and that is all. Hunt's assertion is l and unjustified.

comes next to the case of Maybaum and Druss.[3] investigators studied a case in which facial sis occurred on the right side as an intermittent for twelve weeks prior to death in a patient with erpes and periarteritis nodosa. The aural symp- egan with pain in the left ear, a rise in temperature F., a large bleb on the tympanic membrane and, blebs on the auricle. Two days later, partial ipsi- paralysis of the lower part of the face appeared left side. Histologic examination showed degener- hanges of cells of the geniculate ganglion and of fibers in the adjacent seventh nerve. Some of the f the geniculate ganglion were markedly disin- d and enveloped by numerous capsule cells; others moderate alterations, such as deformity of cell a variable loss of internal structure and nuclear is. The left seventh nerve showed in close prox- to the ganglion advanced degeneration with nal gitter cell and lymphocytic infiltrations. -Brown, Adams and Fitzgerald [2] dismissed the gic report of Maybaum and Druss with the curt nt that "the lesions shown in their illustrations resemble those characteristic of herpes zoster."

e the case of Denny-Brown, Adams and Fitz- is the single instance (according to them) in erature in which a complete pathologic report is f an alleged case of geniculate ganglionitis, it is mmarized in some detail: A man aged 62 had a rash over the head and neck of eight days' n. The pain was severe, limited to the right the face, the occiput and the neck, and preceded ption by two or three days. There was no otalgia; in the right external auditory canal was swollen, d desquamating; in the right occipital and post- r regions there was a vesicular eruption, as well e dry, scaling, red papules, which represented lesions. On the eleventh day of the illness there ed a lower motor neuron paralysis of the right f the face, accompanied by a new eruption of s over the posterior aspect of the right side of ead; three weeks after the patient had been lized, the facial palsy almost completely disap- , and a small fresh cluster of vesicles broke out the right ear. The authors described this case instance of herpes occipitocollaris and auricular with palsy of the facial nerve—"a variety of the me recognized by Hunt"—a statement which will not support. The patient presented obvious s of herpes occipitocollaris and of facial palsy. otographic evidence for aural herpes is unsatis- , and the clinical description of the aural involve- the protocol is too inexact; the vesicular eruption t cephalically and postauricularly is acceptable an involvement of the second cervical derma- in this respect the case is identical, in fact, with case with necropsy, in which the geniculate n was lost in removing the seventh nerve. The t subsequently died of a gastric hemorrhage, and ation at necropsy established a diagnosis of herpes zoster and second and third cervical ganglionitis and myelitis, the second cervical ganglion being virtually destroyed and resembling necrosis due to infarct. Proximally the necrosis extended to the region of entry of the dorsal root; distally it extended a distance of 1 or 2 mm. into the nerve as it issued from the ganglion. The geniculate ganglion contained a normal complement of ganglion cells and capsules, none of which appeared to have suffered any damage, and the intraganglionic nerve fibers were normal. Through the course of the seventh nerve there was a patchy lymphocytic infiltration with foci of degeneration and regeneration and with cellular reaction in the motor fibers of the seventh nerve. Inflammatory reaction and regeneration of the axis-cylinders in the seventh nerve 5 mm. distal to the ganglion were seen. (In the case reported by Hunt in 1905 the pars intermedia or nerve of Wrisberg showed a loss of fibers and sclerosis, while in the case of Denny-Brown, Adams and Fitzgerald the pars intermedia was uninvolved.) Hunt, of course, might classify this case of Denny-Brown and associates as aural herpes zoster on account of the facial paralysis, but the language of the protocol in relation to the presence of auricular herpes is otologically unconvincing. That the case is one of second cervical ganglionitis is obvious. Haymann [8] has drawn attention to the heterogeneous aural conditions which may be coincident with cervical ganglionitis and facial palsy and which need not be causally related to either of the latter conditions. The practice of explaining second cervical dermatomic vesicles as phylogenetic geniculate regressive herpes, a procedure initiated by Hunt, leads to a situation in which the sensory innervation of the ear becomes, in phylogenetic explanations of herpes of the tongue, the pharynx, the nares and the cervical dermatomic locations, a will o' the wisp hunting ground of anatomic question begging.

Therefore, in any case in which the geniculate ganglion shows no involvement at necropsy, it is imperative that the alleged case of herpes zoster auris should be clinically definitive, since Wakeley and Mulvany [9] made the point that in certain cases of herpes occipitocollaris in which the vesiculation is limited to the second and third cervical root zones this may depend for its presence on the intimate anastomosis which is known to exist between the seventh nerve and the second and third cervical nerves rather than on ganglionitis of those roots, as the mode of infection of the ganglion not only is unknown but is in violent dispute. These are the sole 3 cases of necropsy interest in the literature.

Some consideration of the neuro-otologic facts which have been deduced from intracranial section of the seventh nerve can be justifiably included in this comment on the three necropsy reports. So-called idiopathic geniculate neuralgia or tic douloureux of the nervus intermedius and tympanic plexus neuralgia and the surgical cures of these conditions offer little support either to Hunt's thesis that the eruptive focus of aural herpes zoster is in the geniculate ganglion or to its corollary—the geniculate ganglion sensorily innervates the external ear.

Clark and Taylor [6b] in 1910 reported a case of tic douloureux referable to the sensory filaments of the facial

8. Haymann, L.: Ueber Herpes zoster und herpetische Erkrankungen im Ohrgebiet, München. med. Wchnschr. **81**:137 and 164, 1934.

9. Wakeley, C. P. G., and Mulvany, J. H.: A Rare Feature of the Ramsay Hunt Syndrome, with Some Observations on the Sensory System of the Seventh Nerve, Lancet **1**:746, 1939.

nerve, described as a steady pain deep in the ear on the anterior wall of the external meatus, which was completely relieved by intracranial sections of the facial nerve, the nervus intermedius and the upper fasciculus of the eighth nerve. Furlow[7] at operation in a case of otalgia, which he thought to be of geniculate origin, tested the ninth nerve first in the cerebellopontile angle. When this nerve was stimulated, the patient complained of severe pain in the throat, but she experienced no tic pain in the ear. Touching the cephalic end of the eighth nerve produced extreme dizziness and nausea, while stimulation of the caudal half caused severe tinnitus and pain.

Furlow then separated the seventh and eighth nerves, isolating the nervus intermedius; the touching of this produced severe pain in the ear, which subsided on section of the nerve; otologic examination later failed to show any definite gross sensory anesthesia of the external ear or of the superficial portion of the external auditory canal and adjacent parts of the deep canal, though the tympanum on the left side was much less sensitive than the one on the right; likewise the sensitivity of the left drum and adjacent part of the deep end of the canal was considered much less than that in a normal person. Difficulties inherent in such types of testing are obvious and need no stressing. These observations agreed with those reported by Clark and Taylor.[6]

Reichert,[10] on the other hand, operating on a patient with otalgia which manifested itself as paroxysms of sharp stabbing pain deep in the external auditory canal, observed that stimulation of the seventh and eighth nerves produced aural pain but not tic pain, while touching the ninth nerve produced the typical tic pain, which disappeared on sectioning of the ninth nerve, observations which, it will be noticed, are directly contrary to of Furlow. Reichert could demonstrate no ane of the ear postoperatively but did find pharyngeal thesia, as might be expected. Hunt[1h] in 1937, d ing geniculate neuralgia and the operative res Reichert, Erickson, Lillie, Craig and others, den accuracy of Reichert's observation that the case of and Taylor[6] was also one of glossopharyngeal ne and pointed out that Dandy, in an analysis of 23 c glossopharyngeal neuralgia which was primarily lo in the ear, later found pain manifested in the distribution of the glossopharyngeal nerve.

10. Reichert, F. L.: Tympanic Plexus Neuralgia, J. A. M. A. **100**:1744 (June 3) 1933.

REPORT OF CASES

CASE 1.—Baby H., a girl, had a normal birth; second stage of labor was not prolonged; forceps not used, the delivery was not precipitate, there abnormal molding of the head, the child was n according to the accoucheur. At 6 months of age a swollen right ear with fever. The concha, the a

Fig. 2 (case 1).—*A*, patient 4½ years old presenting involvement of the motor division of the seventh and of the second cervical and trigeminal ganglions. To Hunt it is geniculate ganglionitis. The scar the postauricular second cervical dermatome, Hunt's so-called regressive geniculate zone, is shown. zoster auris developed in the child at the age of 6 months with vesiculations in the cleft, which is supp Arnold's nerve, and with lesions along the distribution of the second division of the trigeminal nerve. *B*, the permanent residual paralysis is peripheral and of lower motor neuron type.

and the scapha were sparsely covered with vesicl taining yellow fluid; the auditory canal, especially posterior wall, had a similar show of vesicle tympanum was not involved. The posterior surf the auricle in the region of the mastoid tip a posterior cleft between the ear and the face were with crusted vesicles; the distribution of the postauricularly was most marked in the cleft, on th and on the lobule, in the geniculate "regressive plotted by Hunt[1h] as a cutaneous strip of innerva the geniculate ganglion. On the nose, in the righ labial fold and in the right perioral region the another crop of vesicles. The palate and the nare free of vesicles. No exact history of contac chickenpox could be obtained; impetigo contagios be ruled out. Within three days of the eruptio

facial motor (seventh nerve) paralysis, peripheral, of the lower motor neuron type, developed, unfortunately did not clear up and has not cleared during the past four and one-half years. A hemiparalysis was also present, which has apparently cleared up. The auricular vesiculation of the posterosurface of the lobule left permanent scars, visible in figure 2*A*. There has been some improvement in facial paralysis, the eyelids can be more closely approximated than was possible four years ago, but signs of degeneration in the facial musculature with myoclonic twitching are present; when the child closes her eyes, her mouth twitches to the paralyzed side. The direct corneal reflex is absent, but the consensual corneal reflex is present; the right eye can apparently close at will when the patient violently protrudes her tongue and deviates her mouth to the paralyzed side, but at other times it shows Bell's phenomenon (i. e., on closing of the eyelids the eyeball rolls up); epiphora of the right eye is reported to be present occasionally on eating, possibly the result of crocodile tears due to partial regeneration of secretory fibers to the submaxillary gland along the sympathetic trunks.

The prognosis for return of power in the facial musculature is poor. Historically there was at no time any evidence of syphilitic or tuberculous meningitis, malaria, mumps, petrositis, encephalitis or other causes of bulbopoplegia (paralysis due to involvement of peripheral portions of the facial nerve). At present there are no spasticities of the lower or upper extremities. The biceps are equal; the patellar jerks are normal and equal; there are no pathologic pyramidal tract signs from the tibial reflexogenous zone of the left leg (e. g., Oppenheim or Chaddock); there is no Babinski reflex. A study of figure 2*B* reveals that the paralysis is of the peripheral lower motor neuron type and that it is not a cortical type in which the musculature of the upper two thirds of the face is

Case 1 is of interest first in relation to the rarity of onset of herpes zoster auris: In a review of the literature concerning trigeminal herpes involving the ophthalmic division, the youngest patient in whose case is on record appears to be the one reported by Koch of the Mayo Clinic, aged 5½ years, unless one accepts Kolb's statement (1909) of a case of intrauterine herpes zoster ophthalmicus and other such curiosa. The patient whose case of herpes zoster auris (herpetic ganglionitis) with facial paralysis but without apparent auditory loss (hearing with difficulty) has just been reported is the youngest observed by me.

Second, as to Hunt's thesis, the dual herpetic sites are not only on the base of the cone of alleged cutaneous distribution described by Hunt in his various papers; one herpetic mass was in the cleft between the ear and the face in the sphere of the second cervical ganglion, the exact area of distribution of Arnold's nerve, the auricular branch of the vagus nerve, which carries geniculate fibers, an anatomic assertion on which Hunt laid much stress in his later papers.[1g,h]

This child at present shows marked obtunding of sensation superficially, but no dolorogenetic facial zone can be determined; the tongue when tested for muscular power and sensation appears to be normal. Figure 2*A* shows the pitted scars on the posterior surface of the lobule and the helix, with a large superficial scar in the cleft between the ear and the face (distribution of Arnold's nerve) with a four years' residual lower motor neuron paralysis, apparently permanent. The child evidently had involvement of the second division of the trigeminal nerve with synchronous involvement of both the second cervical ganglion and the seventh nerve. Hunt would postulate a second division gasserian ganglionitis secondary to a major geniculate eruptive involvement, the herpetiform aural lesions lying in the "expanded regressive geniculate zone," a gratuitous assumption so far unproved.

Case 2.—J. P., aged 50 years, was seen May 10, 1937 He displayed a striking, even magnificent herpetiform eruption of three weeks' duration with a paralysis of the left side of the face and tongue. The vesiculations embraced the whole of the left hemicranium with the exception of the left side of the forehead and the left supraorbital region. The patient was a veritable herpetic chimera. The facial paralysis disappeared in two weeks, but the vesicular eruption was prolonged for two months, with severe crusting and weeping. The involvement was accompanied not only by submaxillary adenitis but by epilation of one half of the head, and after seven years the scarred sites of the involvement (fig. 3) are visible above the left eye posterosuperiorly, in the preauricular, the facial and the mandibular regions, on the chin, on the ramus of the jaw, on the buccal cheek above the angle of the mouth and over the submaxillary and parotid regions, the neck and the postauricular areas.

The left ear in comparison with the right ear presents a chewed-up appearance, with half of the lobe scarred and destroyed; the helix is shrunken and atrophic, and a study of the diagrams of the cervical dermatomes (Brock,[11] modified from Foerster) reveals that the patient suffered from herpes occipitocollaris et maxillaris et mandibularis with involvement of the second and third cervical ganglions and of the second and third divisions of the gasserian ganglion.

On Hunt's thesis case 2 would be one of geniculate ganglionitis with subsequent gasserian and second cervical ganglionitis, unless the futile position is taken that the gasserian and second cervical dermatomes have been invaded by regressive wandering sensory fibers of the seventh cranial nerve. Wakeley and Mulvany [9] expressed the belief that such a herpetic picture could represent geniculate ganglionitis (producing seventh nerve motor paralysis), with a spread to the cervical ganglions via the anastomoses between the seventh cranial nerve and the cervical nerves and between the facial nerve and the great

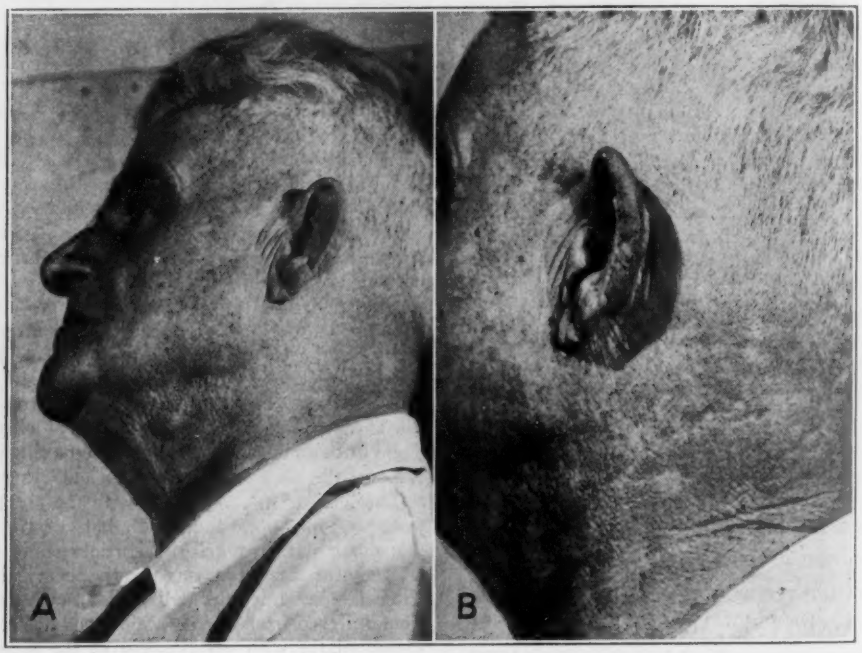
11. Brock, S.: The Basis of Clinical Neurolgy, Baltimore, William Wood & Company, 1938.

auricular nerve, between the posterior auricular and the lesser occipital nerves and, in the neck, between the cervical branch of the seventh and the anterior cervical nerves. It was doubtless a fulminating multiple ganglionitis of the unipolar trigeminal, geniculate, and second and third cervical ganglions, all homologous and histologically alike; McKenzie's [12] case, in which the seventh, eighth, ninth and tenth nerves on one side were involved with recurrent laryngeal paralysis, invites comparison.

In 1907 Hunt had ridiculed the idea that such neuritis by contiguity was ever possible in these words:

> A somewhat fantastic hypothesis which found great favor with certain observers was the following: The herpetic inflammation is supposed to have extended along the peripheral filaments of the trifacial (fifth) nerve, this nerve having numerous points of inosculation with the terminals of the facial. The inflammatory process then passes by continuity of structure, directly from the peripheral filaments of the trifacial to the termination of the facial, in this way producing an ascending neuritis. It is this very "fantastic" hypothesis which has been revived by Wakeley and Mulvany [9] in explaining cases of herpes occipitocollaris in which the lesions are limited to the second and cervical root zones as dependent on the intr anastomoses known to exist between the se nerve and the second and third cervical ne If the "geniculate" zone is really the interca area between the gasserian dermatome in and the cervical dermatome behind, the gass and cervical ganglions by inosculating might overwhelm the geniculate area.

Case 3.—M. F., a woman aged 48, was seen 1944, with the complaint of severe otalgia on th side and nausea. The helix, the scapha and the were hyperemic; the tympanic membrane was mild jected; the pulse rate was 76; the blood pressur 126 systolic and 84 diastolic; the Wassermann re of the blood was negative. Told to return the ne she failed so to do, her daughter telephoning th patient "was very ill with a stomach disturbance" necessitated the calling in of an osteopath for " ments," on account of her "gagging, belching and ing," and that the osteopath feared that she had s a coronary occlusion due to her irregular pulse. vomiting and nausea kept her bedridden for forty hours with a temperature of 99.2 F. At 7 p. m. ber 3, she was seen again in response to a tele complaint that she had suffered a "stroke." Her



3. (case 2).—*A*, patient with a huge scar over the area innervated by the submaxillary (second cer ganglion and scars above the eye and in front of the ear, in the distribution of the second and third t inal divisions, and in the second cervical dermatome seven years after the development of herpes zoster. chewed-up appearance of the ear, with destruction of the lobe and the helix, is striking.

B shows the ear herpetically totally involved. There was facial palsy lasting three weeks, as well as zoster in the areas innervated by the trigeminal (maxillary and mandibular divisions) and second and cervical ganglions. Mills [4] would state that the total aural efflorescence was due to involvement of th serian and the second and third cervical ganglions only and that the aural herpes did not originate geniculate ganglion.

12. McKenzie, D.: Herpes Zoster Oticus Combined with Recurrent Laryngeal Paralysis, J. Laryng. **30**: 339, 1915.

marked; there was no tinnitus, nystagmus or sign eral vertigo. Her blood pressure was 194 systolic 00 diastolic; her pulse rate, 52. The knee jerks hyperactive; the patient was giggling and crying by was playful, was indecorous and maniacal in mood, confused and disoriented in two spheres (for place person), was drooling saliva and was displaying plete peripheral facial paralysis with an associated

was thereafter seen twice daily; the ear was still hyperemic but not vesiculated; labialization was impossible, and there was impairment of taste for sour, sweet and acid.

On the following morning vesicles were seen on the tympanic membrane, on the anterior and posterior walls of the auditory canal, on the meatus, in the concha, on the scapha but not on the helix. These vesicles were

ig. 4 (case 3).—Hunt stated that in formulating his concept of geniculate herpes zoster he decided on eniculate ganglion of the seventh nerve as the sole eruptive site since none of the 35 patients whose cases eviewed in the literature to establish his syndrome had presented pneumogastric symptoms. The patient n here could be alleged to have pure geniculate ganglionitis, according to Hunt's scheme; this patient ested vagal symptoms only at the onset, with no evidence of vestibular involvement.
shows the facial paralysis of the patient. There were nausea, vomiting, bradycardia with an irregular and forty-eight hours' hypertension (blood pressure, 196 systolic) with euphoria and disorientation. *B* *C* show the herpes in the primitive geniculate zone of Hunt's earlier papers, published before he expanded area to take in alleged vestigial regressive wandering sensory fibers of the seventh nerve.

teral lingual paralysis with Noica's sign.[12a] She filled with yellow fluid; the itching and burning within the canal was described as "terrible." Both facial and lingual palsies were present; her mood was still euphoric. The blood pressure was now 156 systolic and 92 diastolic; the pulse rate, 72. The vesiculations were present for

[12a] Wechsler, I. S.: A Textbook of Clinical Neurology, Philadelphia, W. B. Saunders Company, 1943, p. 90.

ten days before healing took place. Her hearing was at all times normal, and there were throughout the progress of the disease no signs of aural vertigo. In the fourth week the facial paralysis began to disappear, the raising of the left eyelid and of the angle of the mouth on the left side being harbingers of the return of function.

The onset of the disease in case 3 was of a certainty vagal, although Hunt might assert that it was geniculate with a secondary vagal involvement. There was at no time any evidence of involvement of the acoustic ganglion. The patient's nausea was not of vestibular origin. The peculiar forty-eight hours' hypertension was repeatedly checked, and the systolic readings were found to be 60 mm. of mercury above her normal systolic pressure. The irregularity of the pulse, the bradycardia, the nausea and the singultus were all marked. The herpetic involvement of the ear (fig. 4 *B* and *C*) and the seventh lower motor neuron facial nerve paralysis constitute a perfect example of the disease type and of the demarcated aural vesicular eruption described by Hunt in his early papers as "geniculate ganglionitis" before he later expanded this alleged geniculate zone by invoking the doctrine of regressive wandering fibers of the seventh nerve.

This case throws light on the question as to whether the eruptions in herpes zoster auris lie within the zone of the geniculate, the trigeminal, the cervical, the glossopharyngeal or the vagal ganglions. Hunt [1e] described how he excluded the cervical and trigeminal ganglions as sites of origin for eruptive foci in aural herpes zoster by the fact of the circumscription of the lesion to a small area (an assumption he later admitted to be incorrect). He next assumed rather illogically that the herpes was of geniculate origin by the "almost" constant association of facial (seventh nerve) palsy with the aural herpes. In a later case (5) it is obvious that there is no fixed relationship between the severity or the area of the aural herpes and the presence or the absence of facial paralysis or of auricular, postauricular or cervical neuralgia.

A third argument used by Hunt to support his choice of the geniculate ganglion as the site was that if the glossopharyngeal ganglion were the primary site of involvement, one would expect signs of pharyngeal irritation and that, further, if the vagus ganglion is to be considered the site of involvement, then, said Hunt, one would expect to see signs of pneumogastric irritation, such as coughing, singultus, bradycardia and nausea. But "in the thirty-five cases of aural herpes zoster analysed by him," he said, "for the formulating of his geniculate hypothesis there was no case of a distinctively pneumogastri or symptoms." If Hunt had read of such would he still have advanced a geniculate for aural herpes zoster?

On the basis of this case one could as declare the "Hunt syndrome" to be vaga glionitis with concomitant aural herpes an enth nerve facial paralysis as allege a gen origin for the infection. It would seem tha ful attention to medical history rather tha zealous interest in the obvious dermatolo pects of aural herpes zoster might reveal cases of herpes zoster auris having a vagal and as the vagal ganglion is known to sensory cutaneous representation on th terior wall of the auditory canal, the po portion of the tympanic membrane, the and the posteromesial surface of the auricl auricular branch of the vagus), the assu that this case presents aural vesiculation to infection of the vagal ganglion can be m readily as the ascription of it to the gen ganglion.

Hunt,[1c] of course, stated that in ana many cases of "zona" of the cephalic ext he had had in mind the possibility of sym which might be ascribed to a disturban vagus function. He quoted Buys,[13] who des the case of a 17 year old girl who had a r ably slow, irregular pulse with frequent ing, suggestive of a disturbance of the nerve, in association with aural herpes zost auditory disturbance. That an infected gen ganglion may give a type of aural herpes be gainsaid, nor can it be denied on the ba case 3 that an involvement of the vagal ga may do likewise.

Case 4.—R. W., a man aged 40, presented efflorescing herpes zoster of the gasserian gangli volving the ophthalmic, maxillary and mandibu visions of the trigeminal nerve. The illness h acoustic onset with aural vertigo, transient facial optic neuritis and symptoms suggesting involvem the third, fourth and sixth cranial nerves. Sin case has been the subject of a detailed report elsew in relation to its ophthalmologic aspects, it is de only briefly here. The herpetic vesiculations involv ear, one half of the face, the mouth and the nare aural herpes was marked, the facial palsy transito gasserian ganglionitis total. The condition observ an example of multiple herpetic ganglionitis, b

13. Buys: Eruption herpètique du pavillon p de phénoménes nerveux considérables, Bull. Soc d'otol., 1898; cited by Hunt.[1f]

14. O'Neill, H.: Total Herpes Zoster of the Og mic, Maxillary and Mandibular Divisions of the T inal Nerve: Report of a Case in Which There Also Involvement of the Geniculate Ganglion a Vestibular Portion of the Eighth Cranial Nerve, Ophth. **33**:327 (March) 1945.

logic order of involvement of the ganglions is ative, although it would seem that the zoster ms were initially cochlear, followed rapidly by f involvement of the fifth and possibly the seventh nerve ganglions. A few vesicles were present the distribution of the maxillary nerve on the left wing to herpetic crossing over (Paton[15]).

nt expressed the belief that since the cranial ry ganglions were unipolar homologues of pinal ganglions they could suffer either a mal or a fractional serial involvement be- the major primary eruptive zone, except he insisted at all times on a major eruptive for the geniculate ganglion and never on a r one.

ke-Elder found in the literature 10 cases only ich herpes zoster ophthalmicus was compli- by optic neuritis. Parry and Laszlo[16] in reported such a complication, describing it re. It is not rare but is rarely reported, prob- owing to the difficulties inherent in the ination of an inflamed, sometimes irido- ic eye and to the fact that ophthalmologists and aurists alike see a minimum and not a maximum number of cases of cephalic herpes. Head and Campbell[5] reported a case of herpes zoster ophthalmicus in which the eruption was limited to the distribution of the first and third or mandibular division of the fifth cranial nerve, while Paton[15] has written of a case in which there was complete involvement of the first and second divisions. Therefore, case 4 is the single instance of total trigeminal herpes zoster combined with herpes zoster auris known to me in the literature.

CASE 5.—J. C., a man aged 35 years, was seen Oct. 3, 1943, with the complaint of severe burning pains over the back of the head and over the left side of the jaw. There was an elevation of temperature to 102 F., with some tenderness shown when the left ear was moved, but neurologic examination otherwise gave negative results, while anterior and posterior rhinoscopy revealed nothing of note. On returning the following day the patient still complained of severe left-sided cephalic and cervical neuralgia. There was moderately severe posterior cervical adenopathy, but the parotid and submaxillary glands were not enlarged. On the third day the pain was severe, and blebs of slightly yellowish fluid were seen on the postauricular area (second cervical dermatome), on the face in front of the tragus, on the left side of the scalp (gasserian and second cervical dermatomes) and on the superior auriculotemporal area (second cervical dermatome)

g. 5.—*A*, preauricular and submaxillary adenopathy with herpes of the auricle and of the areas of distribu- f the three divisions of the trigeminal nerve. *B*, lesions on the nose and in the naris and the mouth, proptosis, keratitis and optic neuritis on the right side. There is total trigeminal herpes zoster with tis profunda and optic neuritis on the right side, accompanied by aural herpes, the single reported case of pe in the literature. The onset displayed a "geniculate" syndrome, i. e., a marked vestibular (eighth cranial) onset, aural herpes zoster, partial involvement of the second cervical ganglion and transient facial palsy. n three days the total trigeminal involvement overshadowed the "primary" involvement of the eighth and sec- ervical ganglions. Since the third, fourth and sixth cranial nerves were later involved, the time of the appear- f the vesiculations gives little information as to which ganglions suffered initially.

Paton, L.: The Trigeminal and Its Ocular ns, Brit. J. Ophth. **10**:305, 1926.

Parry, T. G., and Laszlo, G. C.: Herpes Zoster almicus: Two Rare Manifestations, Brit. J. h. **27**:465, 1943.

involving a pear-shaped area extending about 15 cm. posteriorly from the auricle. On the following day, marked efflorescing herpes involved the auditory canal, the whole auricular appendage and the face for an area extending 5 cm. anteriorly, with a few scattered herpetic vesicles on the left side of the neck. He was warned of the "imminence of facial paralysis" and was repeatedly questioned and examined for hearing loss and for tinnitus aurium. The tongue was impaired neither for taste nor for motion, nor were any vesicles found on the soft palate or in the larynx or the nares. The expected facial paralysis did not eventuate, nor did repeated questioning and observation reveal evidence of either facial weakness or otalgia except mild paresthesia over the area of the second cervical dermatome, never otalgia itself. Despite the swelling and marked herpetic involvement of the ear (fig. 6), the patient ignored it, stating that he experienced in it only a mild burning sensation, not comparable in

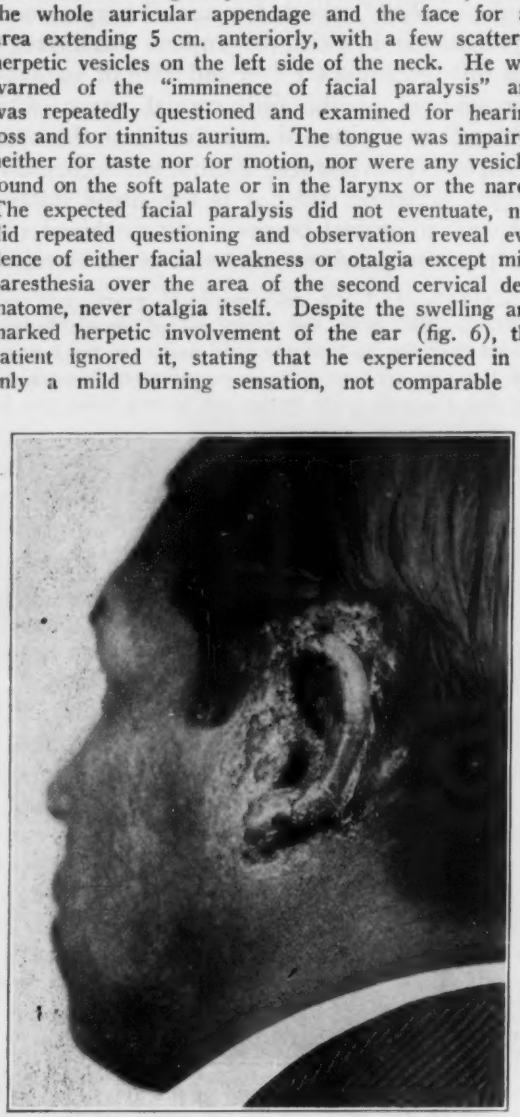


Fig. 6 (case 5).—Patient with herpes zoster auris. The geniculate origin of these lesions is questionable since, despite the severe herpes, the motor root of the seventh nerve was uninvolved: There was at onset a most severe attack of cephalic and cervical neuritis without otalgia but with major auricular herpetiform manifestations, blebs filled with yellow fluid, which coalesced. The herpetic eruptions spilled over to the face and behind to the auriculotemporal area, with a few on the occiput. Despite the severe aural herpes (which Hunt would describe as expanded geniculate herpes, i. e., due to regressive phylogenetic wandering sensory fibers of the seventh nerve) the patient had no facial paralysis.

severity with the neuralgia of the head. At no time during the six weeks of examination were any symptoms of involvement of the seventh nerve, sensory or motor, elicitable, nor was there any subjective or objective evidence that could be related to disturbance of the eighth, ninth or tenth cranial sensory ganglions.

The presenting symptom in case 5 was
neuritis in the area of the second cervical
tome, accompanied by a major herpetic
escence of the auricle with conjoined vesic
of the auriculotemporal area and of the fa
the patient had no facial paralysis, per
facial weakness, otalgia, tinnitus aurium or
cardia. I do not suggest that all patient
herpes zoster auris present cervical ne
many have symptoms ranging from otal
auricular paresthesias. Hunt found ne
symptoms present in the distribution of t
vical nerves in some cases of herpes zoste
but he nowhere mentioned a patient wh
played severe cervical neuralgia without
and with herpes zoster auris. How can th
be another example of geniculate gangl
without evidence of geniculate involveme
symptoms, motor or sensory, referable
seventh nerve, despite the marked aural,
and auriculotemporal herpes which wa
ceded by severe cervical neuritis? Hunt
probably explain the case as one of minima
tional geniculate ganglionitis with complete
efflorescence without otalgia and facial pa
but with maximal second cervical ganglioni
sulting in neuritis without vesiculation. Ot
for instance, Wakeley and Mulvany[9]—
state that the case was really one of gen
origin without facial paralysis, that the c
neuralgia was due to the anastomoses existe
tween the seventh cranial and the cervical
But both versions are convenient examp
otologic speculation. To one following da
clinical course of the disease such explan
are bewildering, even if the aid of the un
able embryologic formula of wandering
sive fibers of the seventh nerve trespassi
the cervical dermatomic area is invoked.
could just as logically and probably mor
rectly suggest not only that cervical gangl
was present in this patient but also that th
ond cervical nerves sensorily encroached
ear from behind, with anastomoses with th
serian ganglion in front explaining the wid
of vesiculation. From the differential diag
standpoint, erysipelas of the ear can be
out on account of the lack of pain and sy
symptoms and the fact that the lesions
blebs filled with yellow fluid; auricular "ec
without at least itching is a clinical neg
there was no history of allergy, and as the
cleared completely with the usual pigm
scarring, the diagnosis of auricular lupus
trophicus is inadmissible.

Case 6.—C. G., a woman aged 56, was see
10, 1933, with a complaint of "heat lightning

right jaw, the right ear and the right side of ck, of the chest, of the face and of the scalp. ain was severe and burning in character. The rature was 100.2 F., and the patient experienced malaise. Permission for lumbar puncture was : The question of encephalitis remained.

the second day of the illness large vesicles ap- over the dermatomic areas of the second and ervical ganglions, along the distribution of the and third divisions of the trigeminal nerve and scapha, the helix and the posterior surface of , in the auditory canal and on the postauricular

ophthalmic division of the trigeminal nerve was olved, but the vesiculations in the distribution second and third divisions of the trigeminal were striking. The herpetic lesions on the upper front of the ear on the face, behind the ear in ft and on the neck, the chest and the scalp were than those of the face and the scalp and healed with less scarring.

The scars on the upper lip (fig. 7) and on the face are sequelae of second division gasserian ganglionitis, while those of the jaw, in the submental region, are combined vesiculations of the mandibular division of the trigeminal nerve and of the second cervical ganglion. The postaural scarring, which is severe, lies in the dermatomic area of the second cervical ganglion in the cleft, an area which Hunt has described as occasionally lying within the domain of the geniculate ganglion. There was neither facial paralysis nor any sign of involvement of sensory fibers of the seventh nerve unless the obvious second cervical and gasserian ganglionitis, affecting the posterior and

7 (case 6).—The ear, anteriorly and posteriorly, the face and the hemicranium were simultaneously involved either facial or lingual paralysis. The twelve year old scarring of multiple ganglionitis (second and third and gasserian) is shown. Parkinson's syndrome followed this herpes occipitocollaris (second and third cerganglions) and maxillary and mandibular gasserian ganglionitis. The scars may be evidence of symptomatic alitic zoster or they may be sequelae of idiopathic herpes zoster.

hows the scarring on the upper lip, in the scapha and in the postaural, submental, preauricular and cervical

hows the severe postaural (Hunt's geniculate site) and cervical scarring (see lesion in clavicular area). taneous aural, facial and cervical involvement, without facial paralysis, was gargantuan, and if the geniculate n was involved how could the seventh motor root escape in so overwhelming an infection?

evere, while those on the concha and the tragus maller, ultimately healing with less scarring. was no facial paralysis, tinnitus aurium or sign f vertigo.

onset in case 6 indicated disease of the ian and second cervical ganglions in re- both the neuritis, which included the ear, e herpetic response, which also included , although the aural vesicles were smaller anterior surface of the ear, are to be classified as geniculate ganglionitis. If the aural herpetiform response is to be considered of geniculate origin, the postaural scarring is another example of Hunt's phylogenetically elusive regressive wandering fibers of the seventh nerve, an anatomic doctrine the futility of the employment of which is here amply demonstrated. There was in this case no clinical evidence of involvement of

the seventh nerve and since there was no otalgia per se but neuritides of the hemicranium and the neck, including the ear, occurring simultaneously without facial or lingual paralysis or disturbance of taste, it can be assumed that neither the motor nor the sensory branches of the seventh nerve were involved and that this major herpetiform response involving the face, the ear, the head and the neck has its origin in the gasserian and second cervical ganglions only. The resemblance of the herpetiform features of this case to those of case 2, in which, however, facial paralysis was present, is definite; it was this type of case which convinced Mills [4] that inflammation of the geniculate

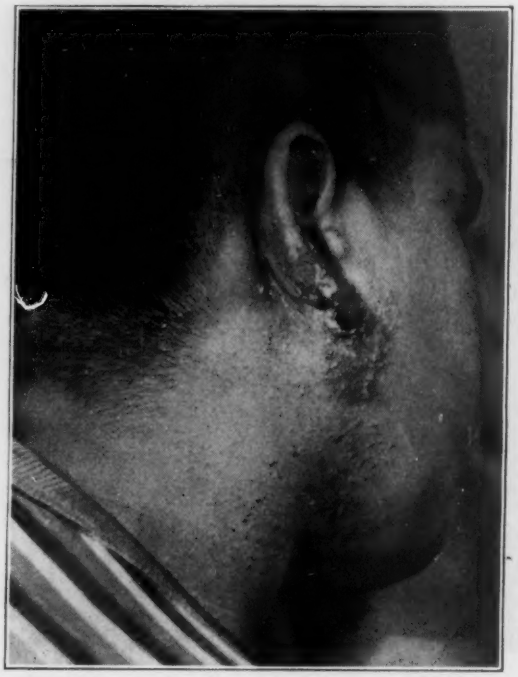


Fig. 8 (case 7).—Herpes zoster auris of two weeks' duration and beginning herpes occipitocollaris in an 11 year old boy. Note the herpes involving the scapha, the fossa, the helix, the lobule and the cleft (Hunt's sometime expanded geniculate zone). A severe attack of cervical and cephalic neuralgia preceded the aural inflammation. Two weeks subsequent to the first attack a second attack of neuralgia occurred in the same dermatome with pain in the face. Vesiculations in their primitive stage appeared; maturing in a few hours, they coalesced into major herpes. There was no facial paralysis, but there was some facial weakness. The frequency of geniculate ganglionitis has been exaggerated, and the importance of the second cervical ganglion as an eruptive site in cephalic herpes has been overlooked.

ganglion when it occurred bore no relation to the presence of aural herpes and that if aural herpes was present, it was the result of combined gasserian and cervical ganglionitis.

At the time of the disappearance of the h typical parkinsonian symptoms of saliv tremor of the right forearm and masklike were noticed, a state which in the past t years has increased in severity. Whethe severe combined herpes occipitocollaris an serian ganglionitis represented idiopathic h zoster or was a manifestation of encep (meningomyeloradiculopolioencephalitis) not be stated with certainty. The patient was 56; conceivably, the herpes was not a tomatic zoster manifestation of encephaliti the patient's present parkinsonian state therefore be on an arteriosclerotic basis. the parkinsonian state occurs acutely foll "encephalitis," the lesion is found in the stantia nigra as opposed to the form which to senile arteriosclerotic degenerative chan the globus pallidus.

Case 7.—M. S., a boy aged 11, was seen O 1944 with what was probably a clinical manife of the current southern California outbreak of gles." On and in the ear small vesicles had dev filled with yellow fluid, following forty-eight ho neuritis of the right ear, right postaural region side of the face and right half of the scalp. The appeared first in the auditory canal and then lobule of the ear; there was no facial or lingual ysis or facial weakness; otalgia was present times, but there was no nystagmus, deafness or vertigo. A fortnight later a fresh attack of n of the right side of the scalp and neck occurre facial weakness, followed in forty-eight hours wi vesiculations (fig. 8), this time on the neck, the and the ramus of the right lower jaw.

According to Hunt's thesis, the prelim herpes in case 7, present not only in H primary geniculate area but in the "exp postaural geniculate zone," was a cuta zosteriform manifestation of geniculate ga nitis which did not affect the motor root seventh nerve to cause facial paralysis, an second crop of vesicles, following cervical ritis which preceded weakness of the righ of the face, was due to infection spreading second cervical ganglion! The facial herpes, would have its origin in a simultaneous inv ment of the gasserian ganglion; the postaura of cutaneous involvement (excluding the lies, however, within the area of the second vical dermatome. As the second cervical ga at times sensorily innervates the ear and inc part of the face in front of the ear, both a could be considered evidence of second ce ganglionitis, or conversely, by the reasoni Wakeley and Mulvany,[9] who pointed ou anastomoses existing between the seventh the cervical nerves, the second crop may anastomotic derivation.

...e there was neither facial paralysis nor ...ess with the initial major herpetiform aural ...ement, it is inconceivable that a geniculate ...ement of this cutaneous magnitude would ...ill over its infection to the motor root caus... least facial weakness, which did occur with ...cond attack of cervical neuritis with herpes ...ocollaris. I consider the case to be one ...rial gasserian and cervical ganglionitis.

...8.—A. L., a woman aged 65, on Oct. 14, 1935 ...ized with severe pain in the left submental ... Within a few hours marked submental and ...illary adenitis occurred, followed by more se... ...ain in the left cervical region. In the late ...on of October 16 marked vesiculation appeared ... submental and submaxillary regions and along ...rus of the left side of the jaw, the third division ...fifth cranial nerve. On the third day of onset ...neuralgia of the left postaural region, the left ... the face, the mouth, the chin and the supra... ... region occurred, with complete flaccid paralysis ... left side of the face. A few hours later, on ...r 17, a few vesicles appeared in the left supra... ... region, but neither the auricular appendage nor ...se was involved in bleb formation; nor was the ...lmic vesiculation as severe as the herpetic out... ...n the neck, the scalp and the submental regions. ...t angle of the mouth showed many blebs (some ... may be seen in fig. 9), and crossing of the eyes at the near point, but not for distance, with diplopia occurred contemporaneously with the facial paralysis; the diplopia (supranuclear type?) is still present in varying amounts. The facial pain, the submaxillary adenitis and the cervical vesiculations lasted seventeen days. There have been moderate attacks of facial neuralgia from time to time since then.

In 1938 associated movements of the angle of the mouth, the nose and the platysma myoides muscle occurred on partial closure of the lids, which during 1937 would not approximate, and this regeneration of the facial nerve fibers the patient construed as being an improvement due to "chiropractic treatments." Since 1940 there have occurred salivary-secretory disturbances, such as salivating "at the wrong time," "dryness of the mouth" and "crocodile tearing" of the eyes when she brushes her teeth, phenomena due to faulty regrowth of the seventh facial nerve, the fibers of which have not made their former normal connections (Brock [11]). At present she shows (fig. 9 *B*) left-sided spastic facial contractures (overtoning), severe excess of ocular convergence (resulting in an annoying diplopia) and abnormal associated movements of the left side of the face, the nose, the neck and the platysma myoides muscle due to 'overtoning."

...9 (case 8).—*A*, the result of herpes zoster of the first and third divisions of the fifth cranial nerve (without ...ular involvement) and of the second and third cervical ganglions with paralysis of the left side of the face. ...empted closure of the eyes, the left eye remains partly open, and the left nostril, the left side of the face, and ...platysma myoides muscle show spasmodic contractures. The scarring of the left side of the lower lip of ...zoster is displayed. Flaccidity of the left side has disappeared after nine years, owing to regeneration of the ...erve, and the facial muscles exhibit here a state of "overtoning" or contracture [11] (the opposite of the ...ty noted during the period of the paralysis). Faulty regeneration of the individual fibers of the facial nerve ...curred, leading to these abnormal associated movements.

...hows the scars of herpes occipitocollaris with the abnormal associated movements of the left nostril, the left ...f the face and the left platysma myoides muscle. The absence of auricular vesiculation and the presence ...al paralysis, ophthalmic and mandibular herpetic involvement and herpes occipitocollaris added nothing to the ...ing of Hunt's "geniculate" hypothesis, as facial paralysis occurred here without otalgia or aural vesiculation.

The severe herpetic involvement in case 8 was that of second and third cervical ganglionitis, with involvement of the supraorbital and mandibular branches of the fifth cranial nerve combined with seventh nerve (facial) paralysis.

There was neither otalgia nor auricular vesiculation at any time. Was this a case of herpes zoster auris with facial paralysis or was it not a case of partial involvement of the fifth and sixth cranial ganglions and second and third cervical ganglionitis with seventh nerve (facial) motor involvement? In this case facial paralysis occurred in a patient with cranial herpes zoster without any herpetic involvement of the ear and, unless one strains the theory of "regressive" errant fibers of the facial nerve to its uttermost, there is no support in this case, at least, for Hunt's thesis that geniculate ganglionitis produces aural herpes zoster with facial paralysis.

COMMENT AND CONCLUSIONS

Herpes zoster auris is not a rare disease but is one that is constantly misdiagnosed and mistreated as "eczema," "barber's itch" and such variants. The disease presents itself in several forms, some of which are primarily involvements of the trigeminal, of the second cervical and of the vagal ganglion. That the geniculate ganglion, as any cranial sensory ganglion, may also be involved cannot be denied, but that such involvement constantly produces otalgia and aural herpes zoster, with or without facial paralysis, as Hunt has asserted, is plainly not in accordance with observed clinical data. Further, to proclaim that all aural, circumaural and juxta-aural herpes lies in the domain of the geniculate ganglion is to proclaim an unproved assertion, nor has Hunt produced any satisfactory necropsy evidence to support his thesis. There have been clinically observed cases that have come to necropsy, but in Hunt's case the geniculate ganglion was lost; in the case reported by Maybaum and Druss,[3] Denny-Brown, Adams and Fitzgerald[2] stated categorically, "the pathologic histology is not in accordance with the picture of herpes zoster" and from the clinical standpoint owing to the admixture of morbid entities presented in their case, there is doubt as to whether the case reported by Maybaum and Druss really represents what Hunt referred to as geniculate ganglionitis.

Unfortunately, in the case observed by Denny-Brown and associates,[2] in which the geniculate ganglion at necropsy was found uninvolved, little can be definitely asserted to contradict Hunt's thesis since these investigators failed to examine the ninth and tenth cranial sensory ganglions which they had reason to believe, from the occurrence of a circumscribed microglial reaction in the lateral portion of the medulla, were singly or doubly involved. Further, neither the clinical nor the photographic evidence in their case is in accordance with the usually acc picture of aural herpes zoster ("genicu ganglionitis), but it does support a diagnos second cervical ganglionitis; and necrosis fo ing infarct of the second cervical ganglion found at necropsy.

Of the cases in which surgical explora have been made for tympanic plexus neur and geniculate neuralgia, Furlow's [7] case is ably the only one offering a clearcut exam experimentally produced geniculate neur while the large number of cases in which sopharyngeal neuralgia has allegedly been suc fully relieved by operation would lead o believe that glossopharyngeal otalgia is t times as common as geniculate neuralgia that, therefore, the ninth cranial ganglion be implicated in the cutaneous eruption of h zoster auris more often than has been assum

It is to be noted that the sensory innerv of the external ear contains the follo elements: (1) facial fibers assumed by Hu to innervate the concha, the tragus, the tragus and the auricular posteromesial sur (2) vagus fibers to the skin near the meatus glossopharyngeal fibers to the deeper par the ear and to the middle ear; (4) trige fibers of the auriculotemporal branches o mandibular division of the fifth nerve to tragus and to the upper part of the au (5) important branches from the cervical pl —i. e., the great auricular and small occ nerves to the cranial surface of the auricle. pictured the ear as a vestigial organ and seventh nerve as a vestigial sensory mecha retreating phylogenetically before the advan fifth nerve. Although these assumptions comparative embryology may buttress his th they also render the problem of auricular h zoster insoluble on any terms except his

Up to 1910 Hunt had definitely asserted a small circumscribed area of the externa was the zone of the geniculate ganglion, when, by 1915, enough clinical cases of "a rant" herpes had developed, with vesicul outside this "primary" area, he expanded original area to include apparently any are the face, in the nares, in the palate and in dermatomic area of the second cervical gan by invoking the doctrine of a phylogeneti regressive ear, innervated by a phylogeneti retreating sensory seventh nerve and an vancing fifth nerve, an assumption consta used to explain those cases of juxta-aural h which are really within the cervical dermat area but allegedly in the expanded sensory of the seventh ganglion.

e could make out just as good a case at for incriminating the vagal ganglion, since estionably in many cases of aural herpes inating vagal symptoms are mistaken as bular. In case 3 (fig. 4), which is a good ple of Hunt's "primary" geniculate classifi-n, i. e., the vesiculation embraces an inter-ed area between the trigeminal ganglionic sentation in front and the cervical gan-ic representation posteriorly, the onset of disease began significantly with symptoms h Hunt said had never occurred in the 35 which he used as the basis for formulating yndrome, i. e., pneumogastric symptoms! e are doubtless many cases of aural herpes with a vagal onset which careful initial vation would reveal. It is often forgotten he second cervical dermatome has a variable ibution, embracing the skin of the occipital the submental area, part of the temporal and at times part of the auricular area. facial boundary of the second cervical der-me meets the sensory area of the trigeminal at a line running down from the vertex in of the ear, and sometimes misses the tragus he helix, while the third cervical dermatome aps the second, taking in the auricle, and at extends onto the thorax (Brock [11]). The of the second cervical ganglion in juxta-aural circumaural herpes zoster has received far ittle notice, and the obvious dermatologic t of the disease has invited more attention it deserves at the expense of accurate history g and observation of the initial symptom plex.

at the geniculate ganglion is necessarily in-d in aural herpes zoster, with or without paralysis, is an unproved assumption. The for geniculate ganglionitis, since the appear-of Hunt's original papers, has rested on the of necropsy material, the difficulty of gain-g Hunt's assertions without such material he variable innervation of the external ear he fifth, seventh, ninth, tenth, second cervi-nd sometimes third cervical ganglions, an mic criss-crossing from which many things be asserted but from which little can be ed.

he assumption that herpetic vesiculation of uricle, accompanied or unaccompanied by riaural or juxta-aural eruption within the ning gasserian and cervical dermatomes, s from the same ganglionic involvement , geniculate) as the inconstant facial paral-is gratuitous, since Taterka and O'Sulli-van [17] pointed out that in spinal herpes zoster atrophic pareses do not necessarily coincide with the cutaneous eruption in segmental localization and extension. They instanced Joffroy's case in which a zoster eruption of the right shoulder was followed by paresis of the adductor pollicis, the interossei and the hypothenar muscles of the same extremity. Parry and Laszlo [16] likewise reported an instance in which a man of 33 with spinal herpes zoster of the chest had double vision with paresis of the right sixth cranial nerve.

Hunt was obviously greatly influenced by the occasional occurrence of facial paralysis in cases of herpes zoster auris, but as the manner in which the herpetic filtrable virus enters the nervous system to attack the dorsal horns is unknown, the mere presence of accompanying motor paralysis proves little. Wilson [18] postulated a blood-borne herpes zoster toxin, and others, following Montgomery,[19] have stated that the symptoms are due to ascending neuritis, a notion ridiculed by Wilson, while the many motor complications of a disease primary in the sensory system has led Wohlwill [20] to discard the concept of acute posterior poliomyelitis promulgated by Head and Campbell [5] and accepted by Hunt [1c] and to adopt the Teutonic Hellenism neuroganglioradiculomyelitis!

That Hunt recognized the possibility of involvement of cranial sensory ganglions other than the geniculate is true, but such involvement to him was always secondary and subsidiary to geniculate involvement and was never a primary entity. It is in such cases as no. 5, in which a clinically closely observed attack of severe neuritis in the second cervical dermatome is followed by a major type of aural zosteriform vesiculation, not in Hunt's original alleged zone of the geniculate ganglion [1a] but in the expanded zone of the alleged phylogenetically regressive wandering sensory fibers of the seventh nerve, that Hunt's geniculate explanation is so totally unsatisfactory. Again, in case 3, in which a preeminently vagal onset of nausea, singultus, dysphagia, bradycardia and hypertension was followed by "classic" vesiculation in Hunt's "pri-

17. Taterka, J. H., and O'Sullivan, M. E.: The Motor Complications of Herpes Zoster, J. A. M. A. **122**:737 (July 10) 1943.

18. Wilson, S. A. K.: Neurology, London, Edward Arnold & Co., 1940.

19. Montgomery, D. W.: Herpes Zoster as a Primary Ascending Neuritis, Arch. Dermat. & Syph. **4**: 812 (Dec.) 1921.

20. Wohlwill, F.: Zur pathologischen Anatomie des Nervensystems beim Herpes zoster (Auf Grund von 10 Sektionsfällen), Ztschr. f. d. ges. Neurol. u. Psychiat. **89**:171, 1924.

mary" geniculate area and marked facial paralysis, the ganglionic site of the major eruptive focus was vagal and not geniculate, unless both ganglions were involved simultaneously.

The term "herpes occipitocollaris" should be employed as formerly to designate second and third cervical ganglionitis, and if a conjoined eruptive inflammation in one or more of the three divisions of the gasserian ganglion is present, as it often is, with or without aural herpes, unless facial or lingual paralysis or disturbances of taste are present, the term "Hunt syndrome" or "geniculate ganglionitis with cervical and gasserian ganglionitis" should be discarded as unproved.

It would seem that, until such time as necropsy evidence substantiates more completely than it has Hunt's assumptions that the geniculate ganglion not only sensorily innervates Hunt's primary cone, the concha, the tragus, the antitragus and the auditory canal, but also at times the postaural region, the nares and the palate, herpetic involvements of these alleged seventh nerve regressive areas should not be referred to as examples of "Hunt's syndrome."

Lastly, if facial and lingual paralysis coexist with otalgia and a cutaneous aural eruption, for want of proof or disproof of Hunt's contentions the term "geniculate ganglionitis" may be used as representing a working diagnosis provided that at the onset of the disease there was displayed neither a vagal ganglionic symptom complex, as in case 3, nor auditory ganglionic symptoms, as in case 4. The theory of a maximum involvement of the vagal ganglion with a concomitant minor infection of the geniculate ganglion, responsible for the aural herpes, however, to explain such a case as no. 3 is unsatisfactory. Aural herpes occurs not only in gasserian and cervical ganglionitis but probably also in vagal or glossopharyngeal ganglionitis. Again, otalgia may be a symptom of either cervical, fifth, seventh, ninth or tenth ganglionic infection, and the remaining member of the triad, facial paralysis, is a motor affectio the seventh nerve, its presence neither pro nor disproving a seventh nerve sensory inv ment; the pitfall in Hunt's assumptions recognized by him, i. e., that herpes zoster cranial sensory ganglion too often exist multiples.

In the 8 patients whose cases I have mitted—one a child of 6 months with re permanent facial paralysis four years later; a man with mixed second and third cervica gasserian ganglionic involvement; one a wo with obvious primary vagal involvement; a man with an acoustic onset complicate total involvement of all three branches o trigeminal nerve; one a man who, clini speaking, had pure aural herpes zoster wi either otalgia or facial paralysis but suffered severe second cervical neuralgia; one a wo with hemicranial involvement, including the sparing only the ophthalmic division of trigeminal nerve and due possibly to encepha with Parkinson's syndrome as an imme sequela; one a boy who in the beginning h major involvement in and of the ear, inclu the postauricular cleft, and a fortnight suffered a fresh attack of neuritis and he of the neck and scalp, and one a woman involvement of the ophthalmic and mandi branches of the fifth cranial nerve and o second and third cervical ganglions without e otalgia or auricular vesiculation and with re eration of nerve fibers previously involve facial paralysis, with facial (overtoned) tractures and abnormal associated moveme in all these patients the protean nature o disease at its onset and during its course is hibited, and the fatuity of assigning all displaying herpetic aural lesions, usually re senting multiple cranial sensory involve primarily and solely to the geniculate gan because in some cases of aural herpes the of otalgia, facial paralysis and aural he manifests itself is obvious.

2122 North Main Street.

PENICILLIN THERAPY IN THE PRACTICE OF OTOLARYNGOLOGY

LIEUTENANT COLONEL GILBERT C. STRUBLE
MEDICAL CORPS, ARMY OF THE UNITED STATES

enicillin therapy is of definite value in the tment of many diseases of the ears, the nose the throat. It is particularly applicable in field, because the great preponderance of ogenic organisms encountered in the practice otolaryngology are of the penicillin-sensitive up.

he penicillin-sensitive and the insensitive anisms commonly encountered by otolaryngists are as follows according to Herrell, hols and Heilman.[1]

cillin-Sensitive Group

Diplococcus pneumoniae	Gram positive
Streptococcus	Gram positive
Staphylococcus	Gram positive
Neisseria intracellularis (Neisseria meningitidis)	Gram negative
Corynebacterium diphtheriae	Gram positive

cillin-Insensitive Group

Bacterium Friedländeri (Klebsiella pneumoniae) (encapsulated)	Gram negative
Pseudomonas pyocanea (Pseudomonas aeruginosa)	Gram negative
Mycobacterium tuberculosis	Gram positive
Haemophilus influenzae	Gram negative

here are many cases encountered in the tice of otolaryngology in which both penicilland the more easily administered and less ly sulfonamide compounds are effective. In cases it has been our custom to employ a onamide compound first. In many critical s both drugs have been used simultaneously. h increasing experience, physicians are now to state with some assurance what type of ase will or will not respond to each therapy. necessity of frequent intramuscular injecns or of a continuous slow intravenous drip in administration of penicillin is a distinct handi- It has been our experience that in giving intramuscular injections the use of more centrated preparations of penicillin in isotonic tion of sodium chloride instead of distilled water contributes much to the comfort of the patient.

One of the great advantages of penicillin is its apparent lack of toxicity for the hemopoietic system. The otolaryngologist is frequently called on to treat patients with acute fulminating infections whose white blood cell count is low or has dropped to alarming levels after a few days of therapy with sulfonamide drugs. Further treatment with sulfonamide compounds is obviously impossible. By changing to penicillin therapy he can safely continue treatment for days without undue concern so far as the blood count is concerned. With increasing experience physicians are revising the doses of penicillin upward and continuing treatment for longer periods than they did at first. Inadequate doses make for chronicity of disease and penicillin-resistant strains of bacteria. Too early discontinuance of penicillin therapy is succeeded by relapses, with increase of dosage and greater length of treatment needed to gain the upper hand over the infection.

ADMINISTRATION

My associates and I have found the following methods of administration to be effective:

1. Parenteral Injection:
   - (*b*) Intramuscular injection, 100,000 to 300,000 twenty-four hours. Solution used—100,000 to 300,000 units of penicillin dissolved in isotonic solution of sodium chloride or 5 per cent dextrose. The amount of fluid used depends on the patient's fluid requirements during the twenty-four hour period.
   - (*b*) Intramuscular injection, 100,000 to 300,000 units administered each twenty-four hour period, dissolved in isotonic solution of sodium chloride, 10,000 units per cubic centimeter. The total amount to be given is divided into eight doses and administered at three hour intervals, day and night.
2. Local Instillation or Other Local Application:
   - (*a*) Instillation into the frontal, maxillary and sphenoid sinuses by cannula, penicillin in isotonic solution of sodium chloride, 2,500 units per cubic centimeter.
   - (*b*) Displacement, ⅛ per cent ephedrine sulfate in isotonic solution of sodium chloride containing penicillin in the concentration of 200 units per cubic centimeter.

. Herrell, W. E.; Nichols, D. R., and Heilman, H.: Penicillin: Its Usefulness, Limitations, Diffuand Detection with Analysis of One Hundred and y Cases in Which It Was Employed, J. A. M. A. 1003 (Aug. 12) 1944.

(*c*) Instillation into the maxillary sinuses through a normal ostium by cannula or by straight antral needle, chlorohydroxyquinidine ointment 1,000 units per gram.

(*d*) Ear drops, penicillin in isotonic solution of sodium chloride, 5,000 units per cubic centimeter.

(*e*) Instillation into the mastoid cavity during the postoperative follow-up period, penicillin in isotonic solution of sodium chloride, 2,500 units per cubic centimeter.

(*f*) Dusting of the mastoid cavity at time of surgical treatment, prior to closure with drainage, pure penicillin powder, 100,000 units.

That relatively high concentrations of penicillin can be obtained in the mucosa of the pharynx by parenteral injection has been demonstrated experimentally (Struble and Bellows [2]).

The following observations are presented from our own clinical experience. The case reports do not represent all patients treated but are presented to illustrate our experience with various typical infections. Our conclusions may be outlined as follows:

SINUSITIS

Penicillin administered by intravenous and intramuscular injection has a favorable effect if the sinusitis is in an early stage and acute empyema has not already developed. In our experience, however, it has usually shown no more promise than adequate and carefully followed-up treatment with the sulfonamide compounds. Rest in bed and adequate nasal ventilation are still necessary.

In subacute and chronic empyema of the maxillary and frontal sinuses and in chronic empyema of the ethmoid and sphenoid sinuses, local penicillin therapy shows great promise.

Acute Empyema of the Maxillary Sinus.—We have employed the old measures, namely, rest in bed, nasal ventilation obtained with nose drops, therapy with sulfonamide compounds and steam. After all evidence of acute reaction has subsided (usually after seven to ten days), we lavage the antrum through the normal ostium with warm isotonic solution of sodium chloride and then instil a penicillin solution (1 cc. equals 2,500 units). About 6 cc. is instilled and left in the antrum. This procedure is repeated in three to four days, and rarely is further treatment necessary. With this plan of treatment the sinus is usually entirely clean in a week and practically never requires further irrigation or a subsequent operation to create a nasoantral window.

Chronic Empyema of the Maxillary Sinus.—The antrum should be lavaged through the normal ostium and penicillin solution instilled as described in the foregoing paragraph before more radical surgical procedures are advised.

Chronic Suppurative Ethmoiditis and Sphenoiditis.—We use displacement by the Proetz method with 2 per cent ephedrine sulfate in isotonic solution of sodium chloride containing penicillin (200 units per cubic centimeter).

In our opinion two factors are present to make these satisfactory procedures. 1. Surgical drainage is obtained during the irrigation through the cannula or by the displacement method. Very high concentrations of penicillin are secured in the sinus treated, without wasting the drug, the preponderance of the penicillin on other tissues as is the case when the parenteral method is employed. In some cases in which response to treatment has been poor, we have later demonstrated the presence of sinal polyps or marked thickened lining mucosa by instillation of iodized poppyseed oil 40 per cent. In other cases apparent suppurative sinusitis has cleared up as far as the infection itself was concerned, only to have a basic underlying allergy manifest itself. The allergic status is not influenced by penicillin treatment.

ILLUSTRATIVE CASES

Bilateral Chronic Suppurative Maxillary Sinusitis.—W. H. S., aged 24, was admitted to a general hospital of the United States Army, May 17, 1944, because of respiratory distress and fever (temperature 104.6 F.).

Examination showed musical rales and suppression of breath sounds over both lung fields. A roentgenogram of the chest revealed no evidence of consolidation. A blood culture was negative. The blood count was normal. Following treatment with sulfadiazine, the temperature dropped to normal, and the patient was referred to the otolaryngologic staff for survey.

The patient stated that he had had similar attacks with cough and wheezing since childhood. These episodes were usually preceded by a chill, fever, sneezing, nose and sore throat. They usually came on in January or October. There was no family or personal history of allergy.

Otolaryngologic examination showed both maxillary sinuses dark on transillumination. The nasal septum was deviated to the right posteriorly, with 90 per cent obstruction. The tonsils were large and chronically infected. In studies for allergy all tests were found to be entirely normal. Bronchographic studies of the tracheobronchial tree of each lung showed no evidence of bronchiectasis. The working diagnosis was allergic bronchitis on the basis of multiple chronic bacterial infections of nose and throat.

On June 21, each maxillary sinus was washed through the normal ostium with return of 6 cc. of pus from the right antrum and 2 cc. of pus from the left antrum. Iodized oil instilled at this washing showed no unusual thickening of the lining mucosa of either antrum. On June 27 both maxillary sinuses were rewashed, again with a large amount of pus in the return flow from each side. Both maxillary sinuses were filled with isotonic solution of sodium chloride containing penicillin in a concentration of 2,500 units per cubic centimeter. On July 4, both maxillary sinuses were again lavaged; both were clean, and the patient's wheezing had disappeared. The tonsils were re-

2. Struble, G. C., and Bellows, J. G.: Studies on the Distribution of Penicillin in the Eye and Its Clinical Application, J. A. M. A. **125**:685 (July 8) 1944.

ly 10, and submucous resection was performed ly 22, after which the patient was returned to with no complaints.

mment: The suppurative maxillary sinusitis was by one local instillation of penicillin solution.

ere Bilateral Acute Suppurative Maxillary Sinus- nd Acute Suppurative Otitis Media on the Left with Spontaneous Perforation.—E. S. B., aged 19, dmitted to the otolaryngologic service, Feb. 25, because of acute suppurative otitis media on the de of twenty-four hours' duration.

drum membrane had ruptured on the previous g. Cultures of the aural discharge showed hemo- streptococci. There was no tenderness over the d process. Nasal examination showed acute naso- ngitis, and both maxillary sinuses were black on llumination. The temperature was 100.6 F. The blood cell count was 8,500, with 66 per cent phils. Roentgen studies of the mastoid processes d both to be normal. Penicillin in isotonic solu- f sodium chloride was divided into eight equal of 25,000 units each (1 cc. equaled 10,000 units) dministered every three hours during each twenty- our period for three days. On February 28 the dose was cut to 100,000 units.

temperature had dropped to normal by the morn- the second day. Four days later only slight ge from the perforation was present, and the had no further complaints referable to the ear, was completely dry by March 4. On March 10, maxillary sinuses were irrigated, and both were to be filled with pus in spite of the fact that atient had received 700,000 units of penicillin. arch 13 both maxillary sinuses were again irri- and were again found to be filled with pus. At ashing 5 cc. of isotonic solution of sodium chloride ing penicillin (1 cc. equaled 2,500 units) was d into each maxillary sinus. Three days later uses were rewashed and found to be clean. This was followed at intervals in the clinic without nce of aural or sinal complaints.

ment: Drainage of the middle ear had been d by spontaneous rupture of the drum membrane. dministration of 700,000 units of penicillin over day period resulted in cure of the suppurative of the middle ear but did not influence the ma of the maxillary sinuses. The sinusitis was by one local instillation of penicillin solution.

eral Severe Chronic Suppurative Maxillary and l Sinusitis.—C. D., aged 24, was admitted to the ngologic service, Feb. 11, 1944, because of severe headache and chronic nasal discharge. This gave a history of bilateral chronic suppurative and maxillary sinusitis dating to 1937. He ceived repeated nasal treatment, including fre- antral irrigation, in civilian life, without lasting . Since 1941, following his induction, he had d irrigations of both maxillary sinuses at numer- my hospitals, without improvement.

the frontal and the maxillary sinuses were black nsillumination and completely clouded on roent- amination. Both frontal sinuses were large and eumatized. Nasal examination showed one small presenting from the region of the nasofrontal n each side and a large amount of purulent l in the middle meatus bilaterally. The polyps emoved and on section proved to be inflamma- d not allergic in origin. Sterile washings from axillary sinuses yielded a pure culture of type 17 pneumococci. A cytologic study of the nasal secretion revealed no eosinophils.

This patient's antrums were irrigated on three occasions with isotonic solution of sodium chloride only, on February 13, 15 and 16, without benefit. On February 18, 100,000 units of penicillin in 1,000 cc. of isotonic solution of sodium chloride was given by slow intravenous drip for a period of seventeen hours, and on the following two days 100,000 units of penicillin was given each twenty-four hours in eight divided doses by intramuscular injection. Washings were again obtained from the maxillary sinuses and cultures made. A pure culture of type 17 pneumococci was again observed, and there was no decrease in the amount of purulent material found in the antral washing. On that date 8 cc. of isotonic solution of sodium chloride containing penicillin in the strength of 1,000 units to 1 cc. was instilled into each maxillary sinus. Both maxillary sinuses were washed two days later, with washings clear, and both transilluminated normally. Cultures of the washings on that date were negative for pneumococci and showed only a few colonies of nonhemolytic staphylococci present. On that date, February 24, the left frontal sinus was irrigated, a frontal sinus cannula being used, and approximately 15 cc. of broken-down pus was evacuated. The sinus was then filled with isotonic solution of sodium chloride containing penicillin, 1,000 units in 1 cc. The patient was reexamined two days later; the left frontal sinus was clear on transillumination and clear on irrigation.

On February 28, acute infectious mononucleosis developed, with a heterophile agglutination titer of 1:160, and the patient was transferred to the medical service for a period of observation and treatment. He was returned to the otolaryngologic service on March 18, at which time the left frontal sinus and both maxillary sinuses remained clear on transillumination and on irrigation. The anterior third of the right middle turbinate was amputated to secure access to the right nasofrontal duct with the frontal cannula. On May 4, the right frontal sinus was irrigated, with return of a large amount of purulent washings; penicillin solution (1 cc. equaled 1,000 units) was instilled. This procedure was repeated on May 6, two days later, after which the right frontal sinus remained clear on transillumination and free of symptoms.

The patient was observed for a period of one month, with no evidence of recurrence, and was returned to duty.

Comment: Cultures showed a penicillin-sensitive organism responsible for the infection. Cure was prompt following irrigation and instillation of penicillin solution. Penicillin by parenteral injection had been ineffective either in changing the bacteriologic aspects of the infection or in lessening the amount of discharge. Anatomic obstruction to the frontal sinus (polyps and pressure from a middle turbinate) required surgical correction.

ACUTE PHARYNGITIS

In most cases acute pharyngitis responds well to intelligent use of time-tried methods of treatment, such as rest in bed, irrigations of the throat with hot isotonic solution of sodium chloride and carefully controlled treatment with sulfonamide compounds. In such cases it has been our custom to continue using these methods and to administer penicillin only when other means of therapy appeared to be inadequate. We feel

this is a logical procedure because of the increased availability, the lower cost and the ease of administration of sulfonamide drugs. We have had cases under our observation, however, in which penicillin was successful after intensive treatment with sulfonamide compounds had failed.

ILLUSTRATIVE CASES

Acute Tonsillitis and Pharyngitis with Laryngeal Edema, Caused by Streptococcus Viridans.—T. E. U., aged 21, was admitted to the isolation ward on Aug. 27, 1944. Two days prior to admission he had noted soreness of the right side of the throat and some general malaise.

On admission his temperature was 102 F. The white blood cell count was 10,850, with 68 per cent neutrophils. The throat showed severe acute follicular tonsillitis, with the right tonsil slightly displaced medially. Severe edema of the uvula was present. Cultures made of material from the throat on three separate occasions showed Str. viridans. Sulfadiazine, 3 Gm., was given as an initial dose, followed by 1 Gm. every four hours thereafter. Irrigations of the throat with hot isotonic solution of sodium chloride were ordered, together with complete rest in bed. For three days some improvement was noted, with the temperature dropping to normal.

On September 1, however, increasing induration and edema of the pharynx developed, with the temperature rising to 102 F. on September 4. Sulfadiazine had been discontinued on September 2, and on September 3 penicillin, 20,000 units, was given every four hours, for six doses daily, by intramuscular injection. The patient was seen by the otolaryngologic service on September 4 because of severe respiratory distress.

Examination on September 4 showed the patient critically ill. He was unable to swallow. There was marked edema of the uvula and of the right tonsil and pillars. This edema extended down the lateral wall of the hypopharynx. The epiglottis was displaced posteriorly and to the left; both arytenoids were edematous. There was no evidence of a diphtheritic membrane. The respiratory difficulty appeared to be caused primarily by an accumulation of mucus in the hypopharynx which the patient was unable to swallow or spit out. Smears and cultures again showed an infection with Str. viridans, with no evidence of the presence of Klebs-Löffler bacilli.

In view of the nature of the pathogenic organisms isolated, Str. viridans, it was our opinion that the patient had received insufficient penicillin therapy. Str. viridans is penicillin sensitive but much less so than the hemolytic streptococci. Three hundred thousand units of penicillin was administered by slow intravenous drip over a period of ten hours. Irrigations with hot isotonic solution of sodium chloride were continued. Diphtheria antitoxin, 20,000 units, was given by intramuscular injection as a safety measure in spite of repeatedly negative cultures.

Following the intravenous administration of penicillin, reexamination at 9 p. m. that evening showed that all the displacement and induration of the right tonsil had disappeared. The edema of the uvula had subsided, and the patient was swallowing liquids. By September 7, after two more days of penicillin therapy (25,000 units intramuscularly every three hours, day and night), all evidence of edema of the hypopharynx and arytenoids had subsided, and the patient made an uneventful recovery.

Comment: Sulfadiazine in doses adequate to tain the blood level of the drug at 12.5 mg. pe dred cubic centimeters proved unsuccessful in c ling the infection. Recovery was prompt fol adequate penicillin therapy.

Acute Tonsillitis with Peritonsillar Abscess Mixed Infection.—H. A. W., aged 18, was a to the isolation ward, Oct. 13, 1944, because o sore throat of three days' duration. The tempe on admission was 100.8 F. The white blood cel was 23,400, with 70 per cent neutrophils. Cul material from the throat showed hemolytic s cocci and staphylococci.

There was marked hypertrophy of both tonsi slight peritonsillar swelling on the left. This received sulfadiazine, 4 Gm., as an initial dose, fo by 2 Gm. every four hours for three days and after 1 Gm. every four hours for three doses.

Local treatment consisted of irrigations wi isotonic solution of sodium chloride. The patie seen by the otolaryngologic staff four days lat cause of increasing medial displacement of t tonsil, considerable trismus and questionable f tion. The temperature was 102.2 F. The white cell count was 8,500, with 71 per cent neutr Incision of the peritonsillar swelling in the usua ner was followed by only scanty purulent dr Sulfadiazine therapy was discontinued and pe therapy instituted, 200,000 units being admin daily in eight divided doses for four days. D this period the throat was irrigated with hot i solution of sodium chloride every two hours the day.

By August 21 the temperature had dropped to n and remained so thereafter. The peritonsillar s absorbed slowly. Considerable exudate contin form on the tonsils. Smears from this material s many spirochetes and fusiform bacilli. A h preparation was injected intramuscularly on occasions, at an interval of three days, and n phenamine, 0.45 Gm., intravenously on one oc Following the antispirochetal therapy, all evide swelling and exudation of the tonsils disappeare the patient was returned to duty.

Comment: Adequate doses of sulfadiazine ineffective in controlling the infection. Incisio drainage yielded little pus. The cellulitis an swelling subsided after 800,000 units of penicill been given by parenteral injection. A coexistin cent's infection was not influenced by the pe therapy but responded to the usual bismuth and cal treatments.

ACUTE OTITIS MEDIA, ACUTE MASTOIDI AND ACUTE PETROSITIS

If penicillin is given early in acute media, the infection may be aborted. It be given in adequate doses and over a suffic long period to prevent development of peni resistant strains of bacteria and relapses.

If given late, it may mask the infectio symptoms.

If the surgical indications for drainag still present, one resorts to myringotom mastoidectomy.

In cases of mastoiditis or petrositis one not rely on penicillin preoperatively or

tively to prevent or control extension of the ion to the meninges or the brain. The gen- rule is: If after mastoidectomy any intra- al extension, present or future, is feared, sulfonamide drugs in addition to penicillin. general, in most cases of acute infection of iddle ear or of the mastoid process we have sulfonamide drugs given early in the se of the disease to be as effective as penicil- We feel that late in the disease, either of agents may mask symptoms and should not lied on.

e procedure of instilling isotonic solutions of m chloride containing penicillin (1 cc. s 2,500 units) into the mastoid cavity dur- he postoperative follow-up period is recom- ed. It has shortened convalescence and ed in a more rapid healing of the wound. cently, we have dusted penicillin powder, 00 units, into the mastoid cavity immedi- prior to closure with drainage. In our on, this procedure greatly shortens the d of drainage and results in a dry, healed on in a minimum of time. The powder rs to be rapidly soluble in the tissue juices effectively sterilizes the cavity for a long d. Kirby [3] has shown that all solutions of illin in isotonic solution of sodium chloride their full potency for seven days and that of them retain their full potency for nine to e days. We have seen no instances of ion, or irritation of wounds or of delayed g following the procedure. Exposure of ura or the lateral sinus has in our experi- not been a contraindication to the use of ered penicillin in the mastoid cavity. Since gan using powdered penicillin in the cavity ese cases, we have found the local post- tive instillation of penicillin solutions to be cessary. In the postoperative care of the l mastoid cavity we have used gauze pack- turated with a solution of penicillin (1 cc. s 2,500 units) and then squeezed dry. ind this maintains a clean cavity without lessens the necessity for frequent repacking e cavity and promotes rapid healing and elization.

ILLUSTRATIVE CASES

te Catarrhal Otitis Media and Mastoiditis with gitis Bullosa.—R. W. H., aged 19, was admitted otolaryngologic service on Sept. 9, 1944. There history of a sudden onset of throbbing in the r which had awakened the patient from sleep ening prior to admission.

The temperature was 102 F. The white blood cell count was 10,000, with 66 per cent neutrophils. Examination showed acute nasopharyngitis, clear sinuses, a normal right ear and acute catarrhal otitis media with myringitis bullosa of the left ear. Hearing was 20/20 in both the right and the left ear. There was no tenderness over the mastoid process. A culture of material from the region of the left eustachian tube showed Str. viridans and hemolytic streptococci on blood agar. Roentgen studies of the mastoid processes showed cloudiness of all cells on the left, without destruction of the cell walls. The roentgen diagnosis was acute mastoiditis.

Penicillin therapy was instituted on the date of admission as follows: For three days 100,000 units was given each twenty-four hours by intramuscular injection in eight divided doses at three hour intervals. The temperature was normal on the morning of the second day and remained normal. The large hemorrhagic bleb of the ear drum showed no regression and in fact became larger, almost occluding the aural canal. All earache, however, had subsided. There was no apparent improvement in the bullous myringitis until February 17, at which time the bleb ruptured, affording an opportunity for more thorough study of the landmarks of the ear drum. There was no evidence of bulging, or of pus or fluid in the middle ear, and the patient had no further aural difficulty.

Comment: The otitis media and mastoiditis did not reach the stage of suppuration. Penicillin given by parenteral injection early in the catarrhal stage affected a cure. The bullous myringitis was not improved by penicillin therapy.

Acute Mastoiditis with Acute Petrositis on the Right Side, Meningitis and Fatal Termination.—J. M. D., aged 23, was admitted to the otolaryngologic service, March 26, 1944, with a history of severe otalgia of the right ear of thirty-six hours' duration. The drum membrane had ruptured spontaneously on the evening before admission.

Examination showed the hearing in the right ear to be 10/20 and that in the left 20/20. The temperature was 101.8 F. A profuse pulsating bloody thin discharge was present in the right external canal. An inferior perforation of the tympanic membrane was present. On pressure over the mastoid process there was slight tenderness at the tip. The white blood cell count on admission was 18,300, with 72 per cent neutrophils. Culture of the discharge from the external canal yielded a pure growth of a very hemolytic streptococcus on blood agar.

Sulfadiazine and sodium bicarbonate, 2 Gm. of each, and thereafter 1 Gm. of each every four hours, were prescribed. The associated acute rhinitis and pharyngitis were treated with nose drops and gargles of hot saline solution, and the patient was kept strictly at rest in bed. The sulfadiazine level was maintained at 6 to 8 mg. per hundred cubic centimeters until March 31, five days after admission, on which day the white blood cell count had dropped to 7,000 and the temperature was remaining normal throughout the day. All tenderness over the mastoid process had disappeared. the aural discharge had become thick and greatly lessened in amount, and the patient had no complaints. For the next seven days the temperature remained normal during each twenty-four hour period. Roentgen studies of the right mastoid process made on April 4 showed diffuse haziness with no evidence of destruction of cell walls. The ear continued to discharge moderately.

Kirby, W. M. M.: Stability of Penicillin Solu- at Room and Incubator Temperatures, J. A. M. A. 28 (July 1) 1944.

On the morning of April 7, at 8 a. m., the patient complained of deep pain in the right ear, and that evening there was an elevation of temperature to 100.2 F. A white blood cell count on that day showed 10,400 white cells, with 68 per cent neutrophils. A count made the following morning showed an increase to 18,650, with 84 per cent neutrophils. A recheck of the hearing on the morning of April 8 showed that it had dropped to 2/20 in the right ear. A recheck of the mastoid process with roentgen rays showed no change since the examination four days previously. The roentgen diagnosis was acute mastoiditis, with no evidence of destruction of cell walls. The temperature by the afternoon of that day was 101 F. A simple mastoidectomy was done that afternoon with the patient under intratracheal ether anesthesia. Pus under pressure was encountered on removing the cortex. The mastoid process, which was large and well pneumatized, was thoroughly cleaned out. (The bone overlying the dura and the lateral sinuses was normal and was not disturbed.) The skin was closed by means of clips, with a Penrose drain. The operating time was fifty-five minutes. The patient was returned to the ward in good condition.

Again culture of pus from the mastoid cavity showed a very hemolytic streptococcus. Penicillin in isotonic solution of sodium chloride was started immediately by slow intravenous drip—the patient receiving 300,000 units the first twenty-four hours, and thereafter 200,000 units daily, divided into eight equal doses and given every three hours day and night. The temperature rose to 104 F. the evening of surgical intervention. By the following morning it had dropped to 101 F.; by the evening of the day after operation it was at 99 F., and it remained at 99 F. during the second day after operation. The patient had no complaints on April 9 and 10; he was eating well, was alert and had no headaches. No neurologic signs were present.

At 1 a. m. on April 11 he complained to the nurse of headaches, and his temperature was 100 F. At 4 a. m. the headache was severe, and the patient was apprehensive and nervous. At 7:30 a. m., while talking to the nurse, he suddenly became unconscious. The eyes showed conjugate deviation to the left, the neck became rigid, and opisthotonos developed. A spinal puncture was done one-half hour later. The spinal fluid was cloudy and under pressure. Sulfamerazine, 91 cc. of a 5 per cent solution, was started by slow intravenous drip, the injection requiring two hours. At noon the temperature was 104.8 F., and the patient died at 12:30 without regaining consciousness. It was planned to give penicillin intrathecally in this case, following the administration of the sulfamerazine. Death occurred before that procedure could be carried out.

Autopsy disclosed no abnormalities except the intracranial findings. The surgical incision in the region of the right mastoid process was opened. The wound and the cavity in the mastoid process were filled with blood clot showing no evidence of infection, and the bone appeared to be clean. No bony defect permitting communication with the intracranial cavity could be discovered. The dural sinuses were explored and found to be filled with normal liquid blood. The base of the brain was coated with tenacious yellowish exudate; the blood vessels were normal. There were numerous adhesions about the superior chiasm and about both middle cerebral arteries. The cerebrum showed no evidence of inflammation over its surface. When the ventricles were opened, both the lateral ventricles and the third ventricle contained cloudy, grayi fluid. Multiple cut surfaces of the cerebr phere in the coronal plane, 1 cm. apart, sho lent differentiation between the gray and matter, with normal basal ganglions and no normalities. Multiple transverse sections of bellum showed no change. Multiple sectio brain stem and medulla, 2 to 3 mm. apart, s abnormalities. The middle ear and the mastoi showed some old dense exudate with some i of organization, and occasional giant cells we in the exudate. From here a more recent active inflammatory reaction extended up into and spread through most of the bony structu petrous pyramid. The marrow space, as we epithelium-lined air spaces, were filled with the epithelium of the air cells was edema congested. At no place was there evidence of extending directly from the inflamed bone thr dural cover. The sections of the saccule, t and the semicircular canals revealed no evi inflammatory reaction. The cochlea was no the most part, though one of the basal coils a few polymorphonuclear cells beneath the lining. The branches of the eighth nerve in the the cochlear spiral contained a moderate number morphonuclear cells. There were many s along the course of the acoustic nerve in variou large numbers were present at the internal meatus. A portion of the geniculate gangli branches of the petrosal nerve was included, a were some polymorphonuclear cells along t bundle.

Comment: The initial otitis media spread to mastoiditis and then general petrositis, involvi ticularly the eighth nerve in the superior-poste of the cochlear coils (without producing layyri and then spread on through the internal meatus to produce extensive meningitis. The ment of the auditory nerve accounts for the drop in auditory acuity. The initial infection case quieted under sulfadiazine therapy but fl when the use of the sulfonamide compound wa tinued. The plastic nature of the exudate base of the brain indicates that the meningitis w than the clinical symptoms (eleven hours) wo cate. It is probable that early meningitis was p the time of operation or soon afterward. The dose of penicillin (700,000 units) administered the first seventy-two hours following operation the clinical picture of petrositis and meningitis. T perature dropped to normal, and the patient complaints until during the early morning h the third postoperative day, by which time th cranial extension had reached overwhelming pro

Acute Mastoiditis and Petrositis and Retroph Abscess.—E. R. N., aged 35, was admitted to t laryngologic service on March 16, 1944. He history of previous attacks of otitis media in th ear occurring in 1923 and 1933, with no further until the onset of the present symptoms ninete prior to admission here. At that time severe had developed on the left side, with spontaneo foration four days later.

He had been hospitalized at another institutio to admission to this hospital and had receiv courses of penicillin therapy, on March 10 and M 100,000 units being administered by intramuscula tion each twenty-four hours in five divided dos 20,000 units per dose over the twenty-four hour

also received sulfadiazine by mouth, 1 Gm., s daily during this period. On admission white blood cell count was 13,750, with 83 neutrophils. The temperature was 99.6 F.

nation showed the patient somewhat confused. plained of severe headaches in the left parietal ain behind the left eye and deep pain behind mastoid process and auricular region, radiating neck. The external auditory canal was filled ck gray purulent discharge. A posterior- perforation of the tympanic membrane was Hearing was 20/20 in the right and 0/20 in ear. A caloric test of the left ear showed ion from the vertical canals and only slight response from the horizontal canal. There nausea, past pointing or falling. Roentgen f the mastoid process showed a sclerotic mas- e with evidence of soft bone in the periantral d high up along the tegmental ridge. The trous apex was cloudy. Culture of pus from t external canal showed Str. viridans. The uid was normal.

he patient anesthetized by intratracheal admin- of ether, a simple mastoidectomy was done on after admission. Ivory-like sclerotic bone was red for one-half inch, until the periantral cells ered. The bone over the dura was necrotic. ra was exposed over an area the size of a and found covered with granulations. There between the dura and the inner table. The inus was exposed over an area at the knee normal. A chain of deep necrotic cells was through the tip, evacuating pus beneath the stoid muscle. The operating time was one d forty minutes.

e of pus from the cavity of the mastoid process a pure heavy growth of Str. viridans. Five f sodium sulfadiazine was given by slow intra- drip immediately after operation, and sulfadia- s taken by mouth from the following day on. ient was given 300,000 units of penicillin by ravenous drip the first thirteen hours, followed 00 units intramuscularly at three hour intervals enty-four hours thereafter. Convalescence was ful except for the development of hematuria, sulfadiazine therapy had to be discontinued on nd postoperative day. The use of penicillin tinued until May 21, after a total of 1,100,000 d been given. By May 24 the hearing had d to 5/20, and by June 9 to 10/20, at which time nage from the middle ear and operative wound sed. By June 13, the perforation of the tym- embrane was healed, and hearing had increased 0. This patient, on routine examination, had arge and chronically diseased tonsils, and his attacks of otitis media were always preceded tonsillitis. For that reason it was felt advis- remove his tonsils before returning him to duty. as done on June 30. Convalescence was un- until July 9, at which time he complained of ng soreness of the fossa of the right tonsil. mperature was normal. Examination showed udate in the right tonsillar fossa, but not ab- in amount. Smears from this showed many cci, a few staphylococci and occasional spiro- nd fusiform bacilli. A bismuth compound was intramuscular injection. On the following day ismus and severe pain had developed in the right he pharynx, with difficulty in swallowing. The ture was 99 F. The white blood cell count was 13,900, with 71 per cent neutrophils. There was a tender gland at the right angle of the mandible. Penicillin, 200,000 units, was given every twenty-four hours, divided into eight equal doses, administered at three hour intervals. The administration of penicillin was continued during July 10 and July 11. On the evening of July 11 a retropharyngeal abscess was discovered low down in the hypopharynx and was drained surgically. The administration of penicillin, 200,000 units daily by intramuscular injection, was continued through July 13, and then cut to 100,000 units daily through July 14. Convalescence, thereafter, was uneventful.

This patient was discharged to duty on August 18 with no complaints other than a slight loss of hearing in the left ear.

Comment: The picture was one of an acute infection superimposed on a sclerotic mastoid process with clinical and roentgen evidence of petrous involvement. Two short courses of penicillin totaling 200,000 units plus the sustained treatment with sulfonamide compounds administered at another hospital had been ineffective in stopping the progress of the infection. Surgical drainage of the mastoid process, the middle ear, the extradural abscess and Bezold's abscess followed by sulfadiazine and penicillin therapy (1,100,000 units) effected a cure of the disease of the temporal bone. Six hundred thousand units of penicillin administered by parenteral injection during a three day period did not cause resolution of the developing retropharyngeal infection. Following the surgical drainage of the retropharyngeal space and the administration of an additional 500,000 units of penicillin over a seventy-two hour period, recovery ensued.

Acute Exfoliative Dermatitis with Acute Otitis Media, Acute Mastoiditis and Septicemia.—T. F. C., aged 31, was admitted to the medical service, Feb. 26, 1944, because of generalized exfoliative dermatitis caused by arsenical treatment of syphilis. The patient was critically ill with weeping dermatitis of the entire cutaneous surface, including the scalp. Considerable edema of the arms and legs was present. The white blood cell count was 15,400, with 33 per cent segmented cells, 18 stab forms and 3 myelocytes. He was treated by repeated blood transfusions, plasma infusion and local care of the skin. On March 23 he contracted an acute infection of the upper respiratory tract and complained of earache. It was impossible to visualize the drum, because of swelling and debris in the external canals—a part of the picture of the generalized exfoliative dermatitis. On March 27 the patient had a chill, with temperature elevated to 104.6 F., and complained of increasing otalgia on the right side, with hearing worse. Hearing of this date was 12/20 in the right ear and 18/20 in the left. The white blood cell count was 25,000 with 68 per cent neutrophils and 14 stab forms. After careful cleansing of the external canal, a good view of the ear drum showed a pulsating discharge from a perforation, posterior and inferior. Smears from the discharge showed streptococci present. There was rather marked tenderness to pressure over the antrum and the tip of the mastoid process. Roentgen studies of the mastoid processes on that date showed them to be extensive and well pneumatized. The right mastoid process showed diffuse generalized haziness throughout, without evidence of cellular breakdown. The roentgen diagnosis was acute mastoiditis. A blood culture taken on March 27 showed a heavy growth of hemolytic streptococci.

Penicillin therapy was instituted on March 27, 300,000 units by slow intravenous drip each twenty-four hours, plus sulfadiazine, 4 Gm. as the initial dose, followed by 1.5 Gm. every four hours. By March 28 the temperature curve had dropped to 100.2 F., and from then on it gradually became flat. By March 30 the white blood cell count had dropped to 9,000. All tenderness over the mastoid process disappeared in two days. The aural discharge, profuse at first, became rapidly less in amount, and by April 10 the external canal was dry and the perforation healed. Hearing had returned to 20/20. Sulfadiazine therapy was discontinued on March 30, after three days of it. The administration of penicillin by continuous intravenous drip was continued for four days, through March 31. The administration of penicillin by intramuscular injection was started on April 1, 25,000 units every three hours, day and night; on April 2 this was cut to 12,500 units each injection. This therapy was continued through April 6 and then discontinued. There were no more symptoms referable to the ear. The hearing remained normal, 20/20, bilaterally. The temperature remained normal throughout the day, and a striking improvement had occurred in the generalized exfoliative dermatitis. This patient thereafter made an uneventful recovery. It is of further interest in this case that the Wassermann reaction of the blood continued positive after the penicillin therapy.

Comment: In this patient acute suppurative otitis media and acute mastoiditis developed during the course of acute exfoliative dermatitis. Bacteriologic study of the secretions of the middle ear revealed the presence of streptococci. The exact onset of the otitis media is unknown, as no view of the ear drum could be obtained at first, because of the multiple furuncles and desquamated epithelium in the external canal. The patient had chills, and the temperature was elevated to 104.8 F. Examination showed a pulsating aural discharge with perforation of the drum membrane and tenderness over the mastoid process. Roentgen studies confirmed the diagnosis of mastoiditis. The blood culture showed a heavy growth of hemolytic streptococci. It was our opinion that this patient probably would not survive even a minor surgical procedure because of his precarious condition, a result of the acute exfoliative dermatitis. Penicillin with sulfadiazine and later penicillin alone was administered as a temporizing measure, with spectacular results. The penicillin administered amounted to 2,200,000 units over a ten day period.

CHRONIC SUPPURATIVE OTITIS MEDIA AND MASTOIDITIS

If cholesteatoma is a possibility, local instillation of an aqueous solution of penicillin as ear drops is contraindicated.

In a considerable number of cases of chronic suppurative otitis media with sclerosing mastoiditis, intensive penicillin therapy, the drug in solution being injected intravenously and intramuscularly over a period of four to five days, has been of no value whatsoever.

If there are a large patent perforation of the drum membrane and chronic otorrhea with no cholesteatoma and no granulations of the middle ear, penicillin solution dropped into the middle ear will in some cases control the local infe temporarily. If granulations are present cannot be destroyed by local caustic therapy instillation of penicillin will prove useless.

In subsiding acute otitis media with a perforation of the drum membrane, the dur of the discharge and the speed of closure o perforation have been favorably influence penicillin solution instilled into the ext canal. (The patient lies on the good ear, canal is filled with solution and the positi maintained for thirty minutes. The streng the solution is 5,000 units in 1 cc.).

ILLUSTRATIVE CASES

Chronic Suppurative Otitis Media on the Right —E. C. S., aged 22, was admitted to the otolar logic service, Jan. 28, 1944, for treatment of ch otorrhea of the right ear, which had been present the age of 4 years.

On the previous October 17, severe pain deve and there was increasing discharge of the right A simple mastoidectomy was performed elsew Following operation, the patient had relief from but the discharge continued. There was no hi of vertigo or headache.

The hearing was 4/20 in the right ear and 20/ the left. The right drum membrane was ret against the promontory. A posterior marginal foration was present, with granulations from the m ear presenting through the perforation. Roe studies of the right mastoid process showed all to have been surgically removed. A culture of rial from the right middle ear showed a growth nonhemolytic staphyloccus.

Penicillin was given by parenteral injection as lows: On February 4, 100,000 units in 1,000 c isotonic solution of sodium chloride was adminis by continuous intravenous drip for twenty-four h On February 5, 6 and 7 100,000 units of penicilli given daily by intramuscular injection in eight doses at three hour intervals. On February 9 a the ear was carefully studied, with no improve being noted. Culture of material from the ear showed the staphylococcus present. The ear was treated daily in the clinic. Granulations were ca ized with 100 per cent trichloroacetic acid each ing, after which penicillin solution, 1 cc. conta 500 units, was instilled into the external canal three hours day and night for two days. (The pa lies on the good ear, the canal is filled with solu and the portion is maintained for thirty minutes.

Examination on February 15 showed the disch much lessened, and treatment was continued thr February 26. All granulations had been destro the attic area was clean and the ear dry. Reexam tion on February 29 showed the ear remaining The patient was given a three weeks' convalesc furlough as a therapeutic test. He was reexam three weeks later; the ear had remained dry, and patient was returned to duty.

Comment: The chronic otorrhea and the bacte logic findings in the aural discharge were not in enced by 400,000 units of penicillin given by parent injection over a four day period. Local instillatio penicillin solution as ear drops plus removal o

ranulations resulted in a dry ear. All diseased ad previously been removed surgically.

nic Suppurative Otitis Media and Mastoiditis of rosing Type on the Right Side.—R. R. B. was ed to the hospital, Sept. 7, 1944, for treatment onic otorrhea, which had been present on the ide since April 1943, following swimming. The denied that there had been "ear trouble" prior ril 1943.

hearing in each ear was 20/20. Examination the right tympanic membrane slightly retracted, posterior marginal perforation and granulations ing from the middle ear cavity. A moderate of foul discharge was present containing diph- s, streptococci and staphylococci. Roentgeno- of the mastoid processes showed an underdevel- nfantile type on the right, with complete sclerosis. patient was seen daily in the clinic. The gran- s were treated with various caustics, including r cent trichloroacetic acid and 50 per cent silver without material benefit.

cillin was given by intramuscular injection, units daily for three days, at three hour inter- ithout any improvement. Local penicillin ther- s then instituted and continued for three days, f isotonic solution of sodium chloride containing nits (the patient lying on good ear, the affected nal filled with solution, the position maintained irty minutes, treatment repeated every three Examination at the end of this period showed provement.

ment: The underlying diseased bone of the attic e mastoid antrum was still present. The granu- could not be controlled or destroyed. Penicillin enteral injection and by local instillation was tive.

SUPERFICIAL AND DEEP CELLULITIS AND CERVICAL ABSCESS

have been privileged to follow and treat iderable number of deep cervical infections, ing the retropharyngeal space, the sub- lary space, and the parapharyngeal space, g's angina and infections extending down scial planes of the neck. In the majority patients these involvements followed dental ons, fracture of the mandible, osteomyelitis mandible, erysipelas or tonsillectomy. We at penicillin has been of great and even ving value in cases of this type, particularly cking or slowing the spread of infection. ny of these cases penicillin therapy was d late in the course of the disease, after y with sulfonamide compounds had failed robably after cell breakdown and early ration had already occurred. In practically hese cases, in spite of large doses of penicil- parenteral injection (600,000 to 800,000 over a forty-eight or seventy-two hour), surgical drainage was required. In 2 of Ludwig's angina following dental extrac- pontaneous drainage through a tooth socket the patient the necessity of surgical incision and drainage. We feel that penicillin therapy is a valuable adjunct to evacuation of the abscess cavity in these cases. It has been our further observation in cases of this type, with the cervical infection originating from oral sepsis, that penicillin therapy will not permanently cure the patient unless the primary focus, such as an infected dental root, osteomyelitis, a tooth in a line of fracture or a bony sequestrum, is cleared up properly by the usually accepted methods.

ILLUSTRATIVE CASES

Cellulitis and Abscess of the Submental Area Following Fracture of a Mandible and Osteomyelitis of the Mandible.—R. W. W. was admitted to the hospital, March 18, 1944, for treatment of a fracture of the symphysis of the mandible accidentally incurred three days previously. The temperature on admission was 100 F. The white blood cell count was 8,800, with 83 per cent neutrophils. The fracture had been reduced and the mandible wired at another hospital.

Roentgen studies here showed a complete fracture of the right horizontal ramus of the mandible at the site of teeth 10 and 11, with local osteomyelitis present. Marked submental swelling and induration of the upper cervical region were present.

Following continuous application of hot compresses to the submental area, localization occurred, and on March 20 incision and drainage were accomplished. Culture of pus from the abscess cavity showed hemolytic staphylococci and nonhemolytic streptococci. Smears also revealed many spirochetes and fusiform bacilli.

Penicillin therapy was instituted on March 20, 200,000 units in 1,000 cc. of isotonic solution of sodium chloride administered by continuous intravenous drip for twenty-four hours, followed by 200,000 units daily for two days by intramuscular injection, given in eight equal doses at three hour intervals. On the day following the start of the penicillin therapy, the drainage had practically subsided, and the drain was removed. Swelling, however, recurred forty-eight hours later, again in the submental area but slightly lateral from the previous area of drainage. This was incised on March 29, with recovery of considerable pus, which yielded a pure culture of the hemolytic streptococcus on blood agar.

The Wassermann test had been reported positive on March 23, and active antisyphilitic treatment had been instituted. Penicillin therapy was again started on April 8 and carried through April 13. A total of 300,000 units was given by continuous intravenous drip the first twenty-four hours, and 200,000 units was given by intramuscular injection daily thereafter in divided doses at three hour intervals. During this period the drainage became somewhat lessened in amount but persisted.

On April 13 right tooth 12 in the line of fracture was extracted, after which the drainage became much less marked but still continued. On April 15 and 17 bony sequestrums in the region of right tooth 12 were removed, after which all drainage ceased. There was no recurrence.

Comment: After the initial administration of 600,000 units of penicillin by parenteral injection plus local incision and drainage the suppuration ceased, but recurred when penicillin therapy was discontinued. Fol-

lowing a second course of parenteral injection of penicillin plus antisyphilitic treatment with arsenical preparations and local incision, the drainage lessened. Permanent cure was not attained until the bony sequestrums and a tooth in the line of fracture were removed.

Acute Cellulitis and Abscess of the Floor of the Upper Cervical Region Following Extraction of a Tooth.—E. J. C., aged 19, was admitted to the otolaryngologic service, March 18, 1944, because of swelling and pain in the left cheek and upper cervical area, following extraction of left teeth 14 and 16 two days previously.

The temperature was 101.2 F. The white blood cell count was 16,200, with 67 per cent neutrophils. Examination showed some cellulitis of the floor of the mouth and of the left buccal area with a hard area of induration below the ramus of the mandible. Sulfadiazine and sodium bicarbonate, 1 Gm. of each, were given every four hours for three days, maintaining a sulfadiazine level of between 7 and 9 mg. per hundred cubic centimeters. By March 20 the white blood cell count had dropped to 10,400, but the neutrophils were up to 85 per cent. The patient showed no evidence of improvement, and the area of cellulitis and induration had extended anteriorly to involve the entire upper left side of the neck. Severe trismus was now present.

On March 20 300,000 units of penicillin in sterile isotonic solution of sodium chloride was given by slow intravenous drip each twenty-four hours for two days. This was followed by 100,000 units each twenty-four hours for three more days by intramuscular injection. A deep-seated abscess ruptured through the site of the extraction of left tooth 14 on March 22, with profuse drainage. Culture of material from the abscess showed hemolytic staphylococci and hemolytic streptococci. By March 26, all drainage had subsided, and the swelling had disappeared. This patient had no recurrence and no further trouble.

Comment: Sulfadiazine therapy instituted on the day symptoms began and carried out for two days was ineffective. Six hundred thousand units of penicillin was given during the next forty-eight hours, after which the deep abscess ruptured through the tooth socket. Penicillin therapy was continued for three more days with rapid cure and no recurrence.

Acute Abscess of the Peripharyngeal Space Following Tonsillectomy.—R. C. was admitted to the otolaryngologic service, Aug. 4, 1944, because of recurrent attacks of tonsillitis and peritonsillar abscess. There was no history of acute infection during the preceding five weeks.

Examination showed chronic hypertrophy and infection of the tonsils. Tonsillectomy was done on August 19, without complication. The right tonsil was found to be adherent and scarred. On microscopic examination the tonsil showed the usual changes compatible with long-standing chronic infection.

For the next week the patient had occasional episodes of slight oozing from the right tonsillar fossa, but the temperature remained normal. The bleeding was easily controlled by pressure with a sterile sponge. On August 19, nine days after operation, he again spat up a little dark red blood. The temperature was 99.8 F. The white blood cell count was 11,750. Sulfadiazine and sodium bicarbonate, 1 Gm. of each, were given every four hours. There was no further bleeding, and on August 22 the sulfadiazine therapy was discontinued, with the white blood cell count 8,900.

On August 23, a slight swelling of the neck at the angle of the mandible was noted, and slight tr was present. The patient, however, felt well, good appetite and could swallow without di The highest elevation of temperature was 99.4 F the following day, August 24, there was some in in the swelling in the neck. Laryngeal exam showed slight edema at the base of the epiglot the right side. The urine showed a few red cells. Irrigations of the right tonsillar fossa hot isotonic solution of sodium chloride were g Two hundred thousand units of penicillin was each twenty-four hours by intramuscular injecti eight equal doses at three hour intervals. The blood cell count was 7,200. On the evening of A 25, a chill developed, and the temperature rose to The administration of penicillin was continued August 26.

Examination on August 26 showed an increa swelling in the neck, which was spreading ante in the region of the submaxillary space and wa extending down the neck about two thirds of th to the clavicle. On the afternoon of August 2 right peripharyngeal space was opened under in tion anesthesia and an abscess containing about of pus evacuated. This abscess was extending dow carotid sheath. A Penrose drain was inserted an wound left open. A culture of the pus from the ca abscess showed a pure culture of nonhemolytic tococci on blood agar. The intramuscular inj of penicillin, 200,000 units daily, was continu August 27 but through error was discontinu August 28.

A transfusion of 500 cc. of whole blood was on August 28. The temperature dropped to n after the surgical evacuation of the abscess, b August 29 the patient began to have a low septic temperature, rising to 100.6 F. in the ev He would awaken early each morning drenched perspiration, requiring a complete change of bed and pajamas. Penicillin therapy was started agai the afternoon of August 30, 200,000 units being each twenty-four hours by intramuscular injecti divided doses at three hour intervals. It was cont through September 3, during which time the temper had again returned to normal and the severe diaph had ceased. All swelling and drainage of the neck stopped by September 8, and the wound was healed by September 10. The patient had no f difficulty.

Comment: In this patient symptoms of deep vical suppuration did not develop until ten days tonsillectomy. The disease progressed in spi 500,000 units of penicillin given by parenteral inj over a sixty hour period, until surgical drainage instituted. Penicillin was given during the first tw four hour period after drainage, 200,000 units, but therapy was discontinued through error. Evidenc sepsis returned twenty-four hours later, but disapp after 800,000 additional units of penicillin had administered over a four day period.

Acute Infectious Mononucleosis with Deep Cer Abscess.—Pvt. T. T. D., aged 20, was admitted t Medical Service, May 31, because of swelling o left side of the neck and the posterior triangle some general malaise. He was afebrile on admis

Physical examination showed swelling of the left of the neck and enlarged inguinal glands. The swe was firm and nodular and involved both the anterior the posterior triangle. The white blood cell coun

, with 32 per cent neutrophils and 60 per cent
ocytes, with many immature lymphocytes present.
eterophil antigen agglutination test was positive in
320 dilution on April 15. There was no evidence
fection in the nose or the throat. A diagnosis of
ious mononucleosis was made.

April 6 the patient's temperature was 99.6 F. and
ril 9, 101 F. On April 10 the test with heterophil
n gave agglutination in the 1:640 dilution, with
ite blood cell count of 14,000. The swelling of
ft side of the neck was progressing, and the
t was having difficulty moving the neck and some
lty in swallowing. He was seen on April 15 by
olaryngologic staff. The temperature was 102.2 F.
white blood cell count was 18,200, with 66 per
neutrophils.

amination showed showed a massive boardlike
ng of the left side of the neck, extending from
andible to the clavicle. Examination of the
x showed the epiglottis displaced to the right.
eft piriform sinus was filled in. No fluctuation
be demonstrated either externally or internally.
was our opinion that suppuration might be devel-
deep in the neck. Sulfadiazine had been started that
ng with an initial dose of 3 Gm.; this was fol-
by 1 Gm. every four hours. Irrigations of the
with hot isotonic solution of sodium chloride
ordered, and two roentgen treatments to the left
f the neck were given that day. On the follow-
ay, April 16, the patient was having difficulty
wing the sulfadiazine, and treatment with that
was discontinued. Penicillin, 300,000 units dis-
in 2,000 cc. of 5 per cent dextrose solution, was
by slow intravenous drip for twenty-four hours.
was followed by another 300,000 units, similarly
istered, on April 17. On penicillin therapy the tem-
re dropped from 102.2 F. to normal. The swell-
f the neck, however, was increasing, and on the
oon of April 18 it was noted that the entire
x was displaced to the right. Surgical operation
ep pus in the neck was advised and carried out
evening.

der local infiltration anesthesia, an abscess dis-
g the carotid sheath downward was evacuated,
recovery of about 60 cc. of creamy pus. A Pen-
drain was inserted and the wound left open.
re of the pus yielded a feeble growth of strepto-
Penicillin, 300,000 units dissolved in 1,000 cc.
per cent dextrose, was given by slow intravenous
he first twenty-four hours after drainage, followed
0,000 units by intramuscular injection, in eight
doses at three hour intervals, during each twenty-
our period for the next two days. The temperature
ned normal, and the swelling gradually subsided.
May 6 the patient complained of severe toothache
e region of tooth 8 on the left. A full mouth
genogram revealed that teeth 8 and 16 on the left
he corresponding teeth on the right were impacted,
evidence of infection around tooth 8 on the left.
May 10 tooth 8 on the left was extracted and
to be definitely infected. The extraction was
ed by rather severe recurrence of the swelling
left cheek and upper cervical area, which, how-
gradually subsided. On June 1 teeth 16 and 8
e right were extracted without complications, and
he 21 tooth 16 on the left was extracted without
ication. The neck had entirely healed by May 6.
patient was discharged to duty on June 23, with
ther complaints.

Comment: We believe that this patient initially had severe infectious mononucleosis only. Ten days later the picture changed to that of deep cervical suppuration (probably a result of the dental sepsis of tooth 8 on the left); at this time the blood picture also changed from one of a preponderance of lymphocytes to one of a preponderance of neutrophils. After 800,000 units of penicillin had been administered by parenteral injection, the temperature had dropped from 102.2 F. to normal, but the clinical picture had not improved. Surgical drainage followed by administration of another 700,000 units of penicillin and extraction of the infected tooth resulted in a permanent cure.

Erysipelas of the Neck Originating from a Pimple Behind the Ear, Associated with Scarlet Fever.—J. K. F., aged 23, was admitted to the hospital on April 15, 1944. He had awakened that morning with a chill, severe malaise, fever and some sore throat. He stated that he had picked a pimple behind the right ear the afternoon before.

His temperature was 104 F.; the white blood cell count was 12,400, with 90 per cent neutrophils. There was a fiery red area in the right cervical region, extending from the posterior auricular region to the shoulder. The throat and the mouth were fiery red. The tongue was red and swollen, with papillary hypertrophy. There was a generalized fine papillomacular rash over the chest, the trunk, the arms and the hands. A diagnosis of scarlet fever and erysipelas was made.

The progress and the treatment were as follows: April 16, after 300,000 units of penicillin had been given by continuous intravenous drip, the patient's condition was unimproved; he was still acutely ill. On April 17 200,000 units of penicillin was given by intramuscular injection in eight doses at three hour intervals. The patient was slightly improved. On April 18 200,000 units of penicillin was given by intramuscular injection in eight equal doses at three hour intervals. The patient was much improved. On April 19 his temperature was normal. The scarlet rash had disappeared. The erysipelas had subsided, so that the patient could freely move the head and neck. Penicillin therapy was discontinued. He had had a total of 780,000 units. On April 21 he remained afrebrile. The white blood cell count was 8,750. On April 23 there was a flare-up of the erysipelas over a 5 cm. area at the site of the original infection. Desquamation was taking place. Penicillin therapy was resumed, 15,000 units being given every three hours by intramuscular injection. On April 25 the patient was afebrile. All swelling had subsided. Penicillin therapy was again discontinued. On April 27 there was cervical swelling under the right auricle with fluctuation. His temperature was 100.2 F. The white blood cell count was 20,200. Surgical evacuation of an abscess containing a large amount of thick green pus was performed. A culture of pus from the neck showed a pure culture of nonhemolytic streptococcus. Penicillin therapy, 20,000 units every three hours, was ordered and continued for the following four days. On May 2 the white blood cell count was 7,800. The neck had healed. Convalescence thereafter was uneventful.

Comment: In this case penicillin therapy was discontinued too soon, with the result that there were relapses and eventual necessity for surgical drainage. A total of 1,820,000 units of penicillin was eventually required for cure.

Severe Acute Cellulitis of the Lateral Aspect of the Nose.—E. L. H., aged 24, was first seen by the oto-

laryngologists on Sept. 27, 1944. He had noted a swelling over the area of the angular vein on the left lateral aspect of the dorsum of the nose twenty-four hours before. He complained of severe headaches over the left eye and behind the eye.

Examination showed a hard red area the size of a quarter at the aforementioned site. The lids were edematous, and slight orbital edema was present. The temperature was 100 F. Penicillin, 200,000 units daily in eight divided doses at three hour intervals, was administered for three days—a total of 600,000 units.

On the day following the first twenty-four hour treatment the temperature was normal, and it remained normal thereafter. All edema of the eyelids had disappeared, and the area of redness was smaller, and absorption appeared to be taking place. A generalized itching rash had developed over the arms and the trunk. Penicillin therapy was continued, however, and the patient was given ephedrine sulfate in 3/8 grain (24 mg.) capsules by mouth every four to five hours. Under this therapy, the rash disappeared and the penicillin therapy was carried to completion. All redness had subsided at the end of three days, and no further difficulty was experienced.

Comment: The acute cellulitis had not reached the stage of suppuration. Resolution and healing were dramatic following a seventy-two hour course of therapy with penicillin.

CONCLUSION

Penicillin is of great value in many diseases of the ears, the nose and the throat. It should not be relied on to prevent impending intracranial complications of aural or sinal origin, because it does not reach the spinal fluid in appreciable amounts. Instead patients with disease of this type, after any necessary surgical drainage, should be treated with sulfonamide compounds, which do reach the meninges and brain. There is no contraindication to the simultaneous administration of both penicillin and the sulfonamide compounds. We have treated a number of critically ill patients with both at the same time, with entirely satisfactory results. In fact, it appears clinically that when penicillin and sulfonamide drugs are administered simultaneously, one appears to enhance the effect of the other. Penicillin therapy is of definite value in the treatment of patients who have septicemia due to thrombophlebitis of the lateral sinus in diseases of the mastoid process, particularly after any necessary surgical treatment has been accomplished. If used in any condition, penicillin must be given in adequate dosage and over a sufficiently long period to cure the infection; otherwise penicillin-resistant strains of bacteria will develop and relapses will occur. Penicillin, like sulfonamide compounds, can have an effect masking the presence of disease until the attending physician is alert to this possibility. The general principles and indications for surgical drainage remain unchanged.

The following medical and dental officers gave technical assistance during phases of this work:

Lieutenant Colonel F. A. Rice, Major J. R. [illegible], Major R. R. Preefer, Lieutenant N. R. Embry, [illegible], A. L. Sparks, Major A. J. Kreft, Captain H. [illegible] Barnaby, Captain R. H. Hickman and Lieutenant Colonel Y. N. Pitkin.

HISTOPATHOLOGY OF THE INCUS AND THE HEAD OF THE MALLEUS IN CASES OF STAPEDIAL ANKYLOSIS

JULIUS LEMPERT, M.D., AND DOROTHY WOLFF, PH.D.*
NEW YORK

hough many reports have appeared in the ature describing otosclerotic foci observed in the bony capsule in postmortem histo- studies of temporal bones, few histopatho- studies of the incus and the malleus in presence of such otosclerotic foci in the rinthine capsule have been reported.

1940 Covell[1] reported on the ossicles in emporal bones showing otosclerosis found Nager's postmortem collection. He observed al otosclerotic foci in both malleus and s from both right and left ear in only ase. Nager[2] himself reported further his same group of temporal bones, stressing icularly the altered position of the ossicles, lting from changes in the joints, which may to complete immobilization of the malleus. uild[3] in his study of the microscopic sec- s from the collection of temporal bones in Johns Hopkins University Medical School ein otosclerotic foci were observed and re- ed, did not mention pathologic changes in malleus and the incus.

ur investigation embraces a series of micro- ic observations made on specimens of these ossicles removed from 115 ears of living nts. The incus and a portion of the malleus routinely removed in the performance of fenestra nov-ovalis operation for improve- t of hearing in clinical otosclerosis. These cles were preserved in solution of formalde- U.S.P. (1:10), decalcified in trichloroa- acid, embedded in celloidin (a concentrated aration of pyroxylin), sectioned serially and ed with hematoxylin and eosin or with sson's stain. They were prepared in the her Laboratory of the Massachusetts Eye and Ear Infirmary. Each specimen was studied and the histologic report made without the observer knowing the clinical history and the general physical findings other than those known to concern immediately the diagnosis of clinical otosclerosis. An attempt to correlate the histologic observations with the general physical and clinical picture was made only after they had been checked and reported. This was done with the hope that further data regarding the disease of otosclerosis might be accumulated.

NORMAL ANATOMY

The bone structure of the malleus and the incus is in many respects quite comparable with that of long bones elsewhere in the body. As in other bones, there are haversian systems, haversian canals, lacunas, canaliculi and centrally located marrow spaces. There are certain features of these ossicles, however, which are unique. These are: (1) the miniature size of the bones, the adult state of which is attained in earliest infancy; (2) their more or less isolated position in space (the middle ear cavity); (3) their complete envelopment by mucosa which is continuous with the mucosal lining of the middle ear; (4) their practically constant activity, uncontrolled by the will.

The blood supply of these ossicles comes from their nutrient artery, a branch of the middle meningeal artery. It penetrates the tegmen to reach the middle ear, thus taking a somewhat recurrent course. Its branches assume the caliber of arterioles found elsewhere in the body. Of necessity they are end arteries, with no space for collateral anastomosis.

The normal histologic structure of these small bones is well illustrated in figure 1, which is a photomicrograph of the short process of the incus in situ in the aditus ad antrum in a non-otosclerotic specimen collected at a routine autopsy. Near the posterior border of the ossicle a strand of mucosa is seen passing from the wall of the middle ear to the ossicle. At a lower level this could be seen to enclose the posterior liga-

---

Research Fellow in Otology, Harvard Medical ol.

Covell, W. P.: The Ossicles in Otosclerosis, oto-laryng. **28**:263-276, 1940.

Nager, F.: Changes in the Ossicular Chain in clerosis, Schweiz. med. Wchnschr. **71**:757, 1941.

Guild, S.: Histopathological Otosclerosis, Ann. , Rhin. & Laryng. **53**:246-266, 1944.

ment of the incus. The mucosa completely envelops the ossicle. In figure 2 a relatively large marrow space containing hemopoietic marrow is seen in the head of the malleus of a newborn infant. Several important anatomic features are well illustrated in figure 3, a picture of the malleus and the incus in articulation in situ. This was taken from a vertical section of the petrosa of a 42 year old woman. Near the center of the head of the malleus is a marrow space containing a fatty type of marrow. In the descending process of the incus is seen a haversian canal with a sizable vessel emerging to the surface. Near the articular capsule a much smaller haversian canal occurs.

Areas of calcified cartilage cells, known as globuli interossei, so characteristic of the enchondral layer of bone in the otic capsule, are found scattered through the ossicles (fig. 2).

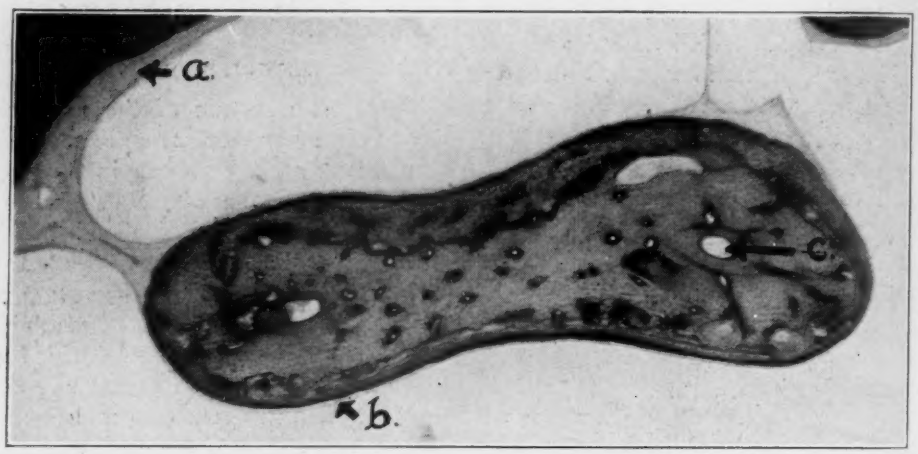


Fig. 1.—The normal ossicular bone structure as seen in a horizontal section of the short process of the i in situ in a 4 month old infant: (*a*) mucosa lining the middle ear; (*b*) mucosa covering the ossicle; (*c*) h sian canal. The isolated bone is covered with mucosa which is continuous with that lining the middle ear.

These areas must not be confused with areas of true histologic otosclerosis. Oesterle [4] has shown that globuli interossei may occur at any age and illustrates some occurring in a 66 year old man, in the ossicles.

The juxtaposed articular surfaces of the malleus and the incus are very irregular, passing through all planes in space. The ossicles possess "cogs" (Politzer and Helmholtz) or protuberances which hold the bones securely locked to each other (fig. 4). Between the two articulating surfaces is a small interarticular disk. The surfaces of the articulating portions are covered with hyaline cartilage (fig. 5). The surface of this cartilage facing within the joint capsular cavity is smooth. As it recedes from the surf and approaches the bone, the cells become q irregular and are often heaped up as they applied to a very irregular bony contour. Th bone cells are atypical in appearance.

As previously stated, the malleus and the in are in constant activity and cannot be put at r at will. Thus the malleoincudal and incu stapedial joints differ from all other joi in the body. Next to the vertebral joints, t represent the oldest joints of the body, c sidered both from the phylogenetic and fr the embryologic point of view. The ossi have evolved from the gill arches, which, as n be checked in the dogfish, are jointed.

HISTOLOGIC OBSERVATIONS

In the early stages of this investigation, area such as is illustrated in figure 6 was thou

possibly to be a "center" or focus of otoscler but further study revealed that it occurred n or less constantly on the inferior surface of short process of the incus in this series of c Rearrangement of the plane in which sect were cut and comparison with ossicles secti in situ in nonotosclerotic postmortem specim revealed that this was really the cartilagi base of the pit or notch which is the plac insertion of the ligament of the short pro of the incus. Figure 7 *A* shows this struc in an otherwise normal ossicle in the series f patients with a clinical diagnosis of otoscle on whom operation had been performed. Fi 7 *B* shows it in a pathologic specimen of series. Figure 8 *A*, *B* and *C* illustrates the tilage-lined notch or pit as seen under the power of the microscope. Similar circumscr areas of cartilage and atypical bone may o

4. Oesterle, F.: Ueber den Feinbau der Gehörknochelchen und seine Entstehung, Arch. f. Ohren-, Nasen- u. Kehlkopfh. **135**:311-327, 1933.

nally be seen in the midst of a routine picture normal bone when the sections of the articular face of the "cogs" of one ossicle appear in a tion of the other ossicle if the bones are in

ig. 2.—The head of the malleus of a newborn infant, wing the marrow space: (*a*) articular surface; (*b*) row space; (*c*) globuli interossei. Numerous globuli rossei may be seen.

iculation at the time of cutting. Thus such as might be seen in either the malleus or the us if the plane of sectioning happened to be ilar to that indicated by the dotted line in re 4.

Just as these bones have an anatomic structe similar to that of other bones of the body, also are they subject to similar pathologic changes. In studying the ossicles it is clear that few bones in the series can be considered normal. A complete absence of pathologic changes was reported for only 5 specimens. When studied in serial section, most of the bones exhibited some degree of pathologic change. It is difficult to evaluate the significance of the changes. They may represent one or more of the following conditions: (1) pathologic change that is a part of stapedial ankylosis, (2) alteration consequent to the disease, (3) unrelated pathologic involvement.

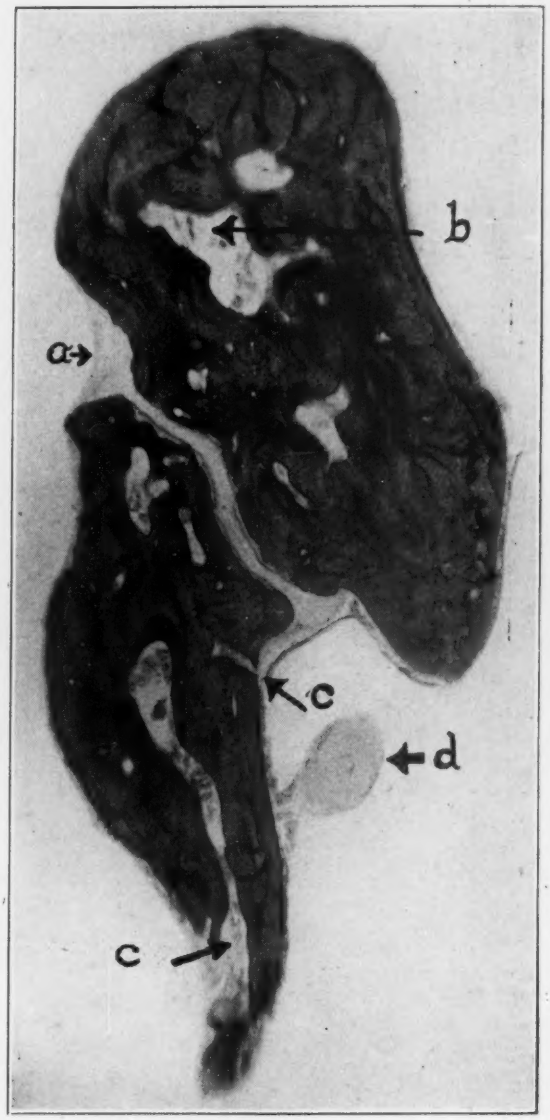


Fig. 3.—A vertical section from a nonotosclerotic adult petrosa (42 years) showing the malleus and the incus in articulation: (*a*) ligament of the joint; (*b*) marrow space; (*c*) haversian canal; (*d*) chorda tympani.

The abnormalities commonly observed in these cases of otosclerosis were:

1. Irregular bony contours and fibrotic replacement of bone.

2. Blue mantles.

3. Changes in the marrow spaces, which include: (*a*) tortuosity of vessels, (*b*) venous stasis, (*c*) arterial congestion, (*d*) periarteritis, (*e*) endarteritis and (*f*) osteoporosis.

4. Pathologic changes in the ossicular joints.

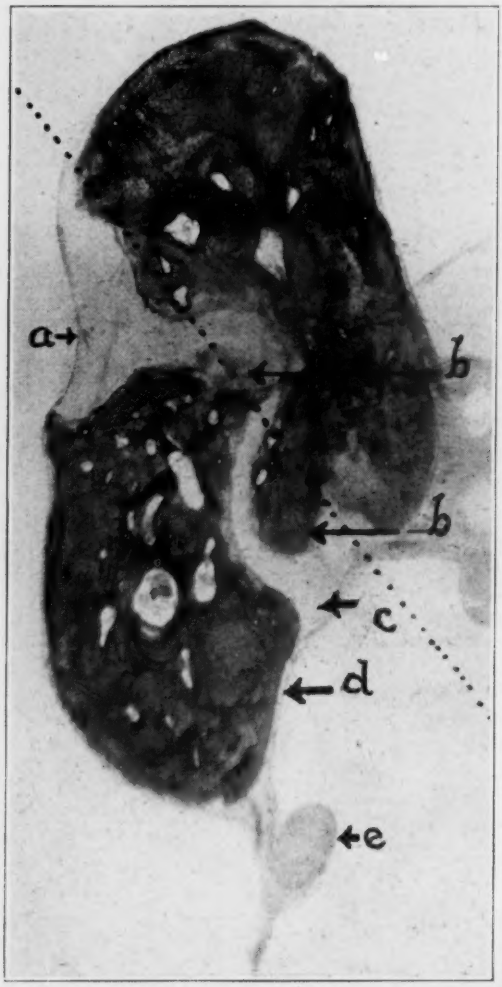


Fig. 4.—The malleoincudal joint showing the "cogs" which hold these ossicles securely locked to each other: (*a*) ligament of joint; (*b*) cog; (*c*) interarticular disk; (*d*) mucosa; (*e*) chorda tympani. The dotted line indicates a plane of sectioning whereby circumscribed cartilaginous areas may appear in the midst of the bone of the other ossicle. The section is from a nonotosclerotic adult temporal bone (42 years).

Irregular Bony Contours and Fibrotic Replacement of Bone.—The normal contour of each ossicle is so well known that any deviation therefrom is readily detected. Care must observed, however, properly to interpret tours in relation to the plane of cut Irregular contours of these bones were obse in 57 per cent of the cases. The type of irr larity varied considerably. In 23 per cen the cases the irregularity was obviously du marginal erosion with fibrotic replacement of bone; thus the bone came to have a moth-e appearance such as is illustrated in figure The areas of peripheral fibrosis appeared usu to be initiated in the region of Howsh lacunas or where the nutrient vessel of the emerged to the surface at the base of the muc with which the ossicle was covered. F bone cells appeared to become fibroblasts. osteoclasts were observed taking part in resorption of bone.

A second source of fibrotic replacement found in fibrosed marrow spaces, a condi which was initiated by periarteritis as descri in a subsequent paragraph dealing with pa logic changes in the marrow spaces. In sev cases the entire lower portion of the descend process of the incus had succumbed to fibr replacement which could be traced to the fibr marrow space in the body of the ossicle. instances the replacement occupied one third one half of the descending process, respectiv Less extensive degrees of fibrotic replacem of the lenticular process of the incus are il trated in figure 10.

A case of extensive fibrotic replacement of head of the malleus is illustrated in figure It was an instance in which, as will be discus under the heading of "Correlation of Pathol Changes with Clinical Histories," the mi scopic observations were explicable on a b other than that of otosclerosis. Neverthel the history of the case suggests the explana of the pathologic changes in those cases in wh the only diagnosis is otosclerosis, as will further treated in the comment.

Irregular contours may also be produced deposition of new bone over the periphery the old surface. This was observed to t place in either of two locations. The new d osition of calcium occurred (1) peripherally the submucosa as illustrated in figure 12 *A* (2) immediately along the surface of the bone at the base of the mucosal covering (12 *B*). In the first instance the deposition in the connective tissue immediately beneath mucosa. In the second, the calcium was doubtedly deposited by simple accretion

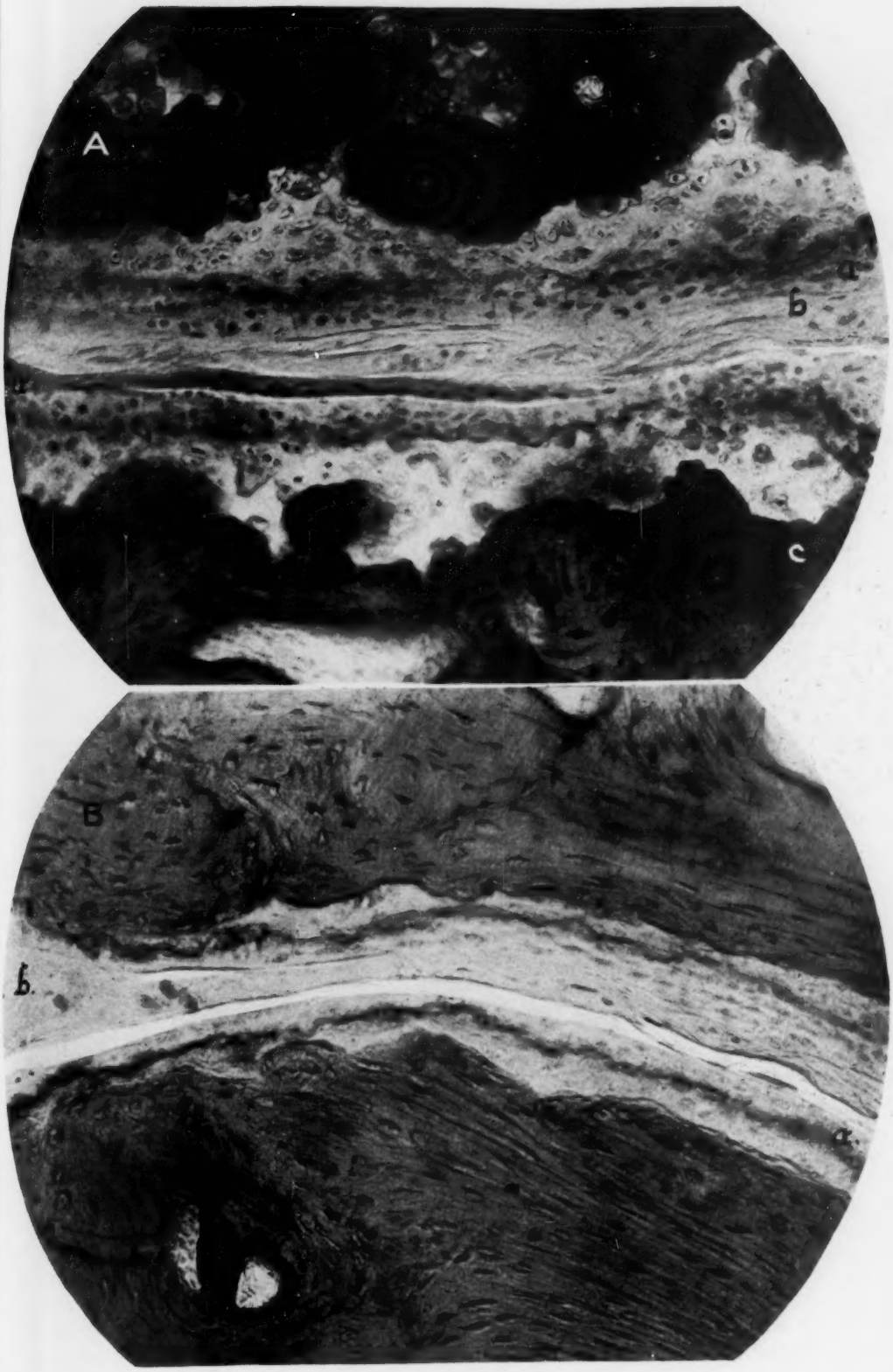


Fig. 5.—*A*, detail of the joint surface in a newborn infant: (*a*) hyaline cartilage; (*b*) interarticular disk;) bone. *B*, detail of the joint surface in an adult aged 42 years: (*a*) hyaline cartilage; (*b*) interarticular disk;) bone.

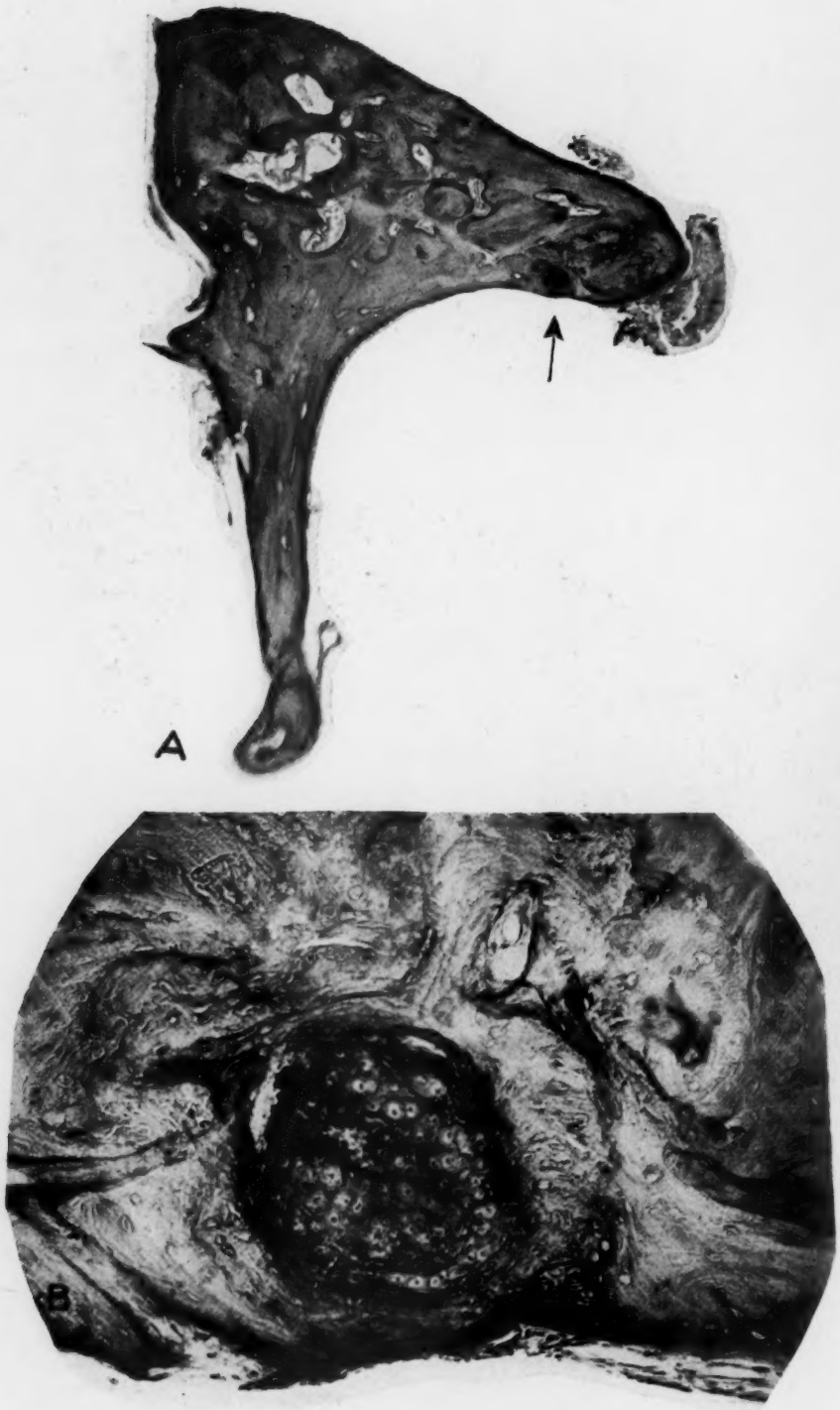


Fig. 6.—Circumscribed "center" of cartilage sometimes erroneously thought to be a center of otoscler
A shows its location; *B*, a high power magnification. See text for a possible explanation.

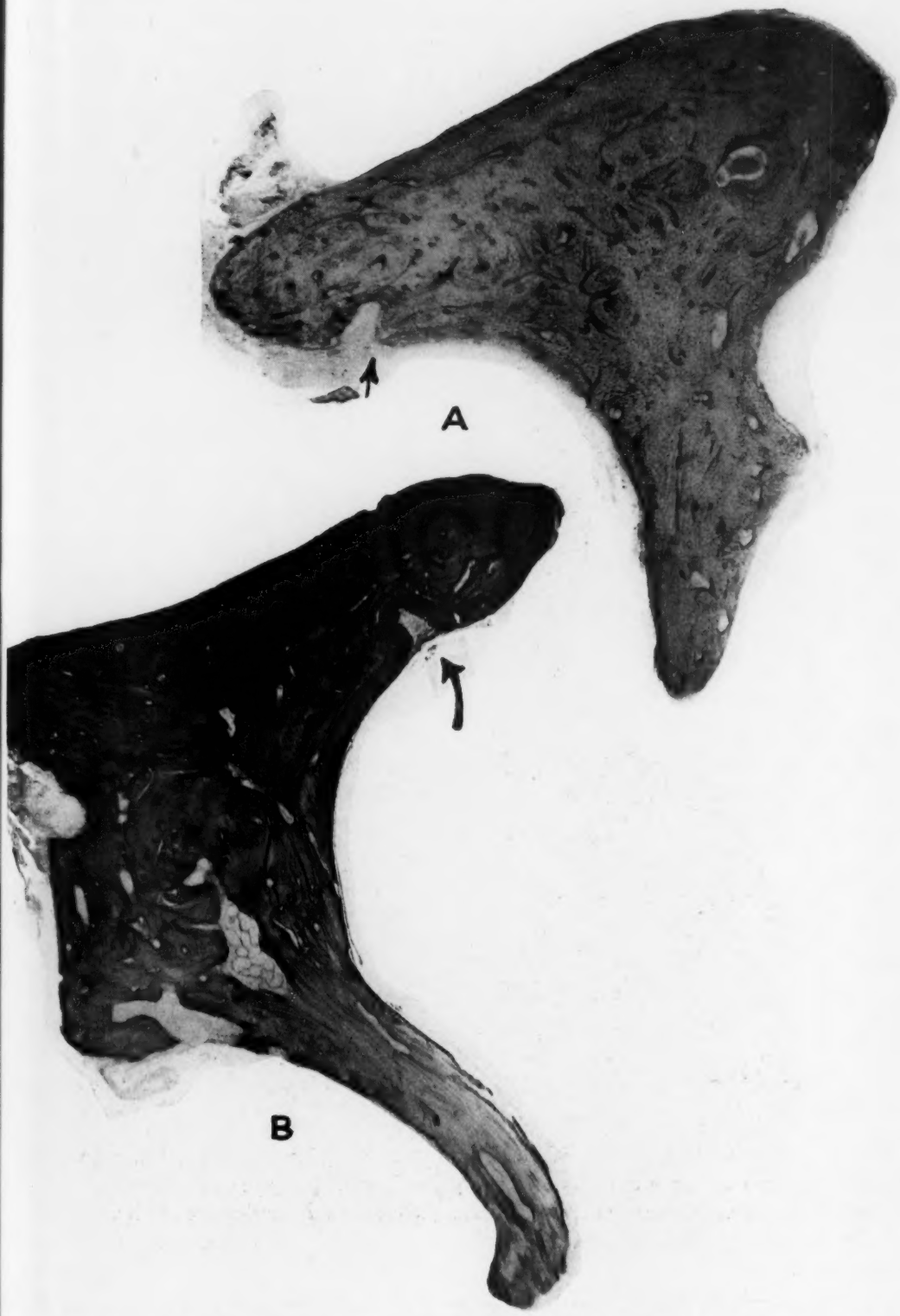


Fig. 7.—The notch in the short process of the incus, a normal anatomic structure: *A*, a normal ossicle; *B*, a ...ologic ossicle. The notch is the place of insertion of the posterior ligament of the short process.

process well known in pathologic alterations of bone elsewhere in the body. Osteoblasts were not observed taking any part in this deposition of bone.

Distorted shapes of ossicles produced by processes other than erosion, fibrotic replacement or accretion are illustrated in figure 13. An attempt to correlate these findings with the clinical histories led to no conclusions. Altered stresses and strains on the ossicular chain consequent to otosclerosis may be responsible. In

normal (as evidenced by the staining reactio
along the course of the blood vessels as th
ramify through the bone. The deposits take
bluer dye with hematoxylin. Consequently
channels of blood vessels or haversian can
look like conspicuous tree trunks with branch
spreading through the bone. In later stag
apparently some of these channels become co
pletely occluded with calcium. Since there
evidence of hyperemia and formation of n
blood channels (Volkmann's canals) in o

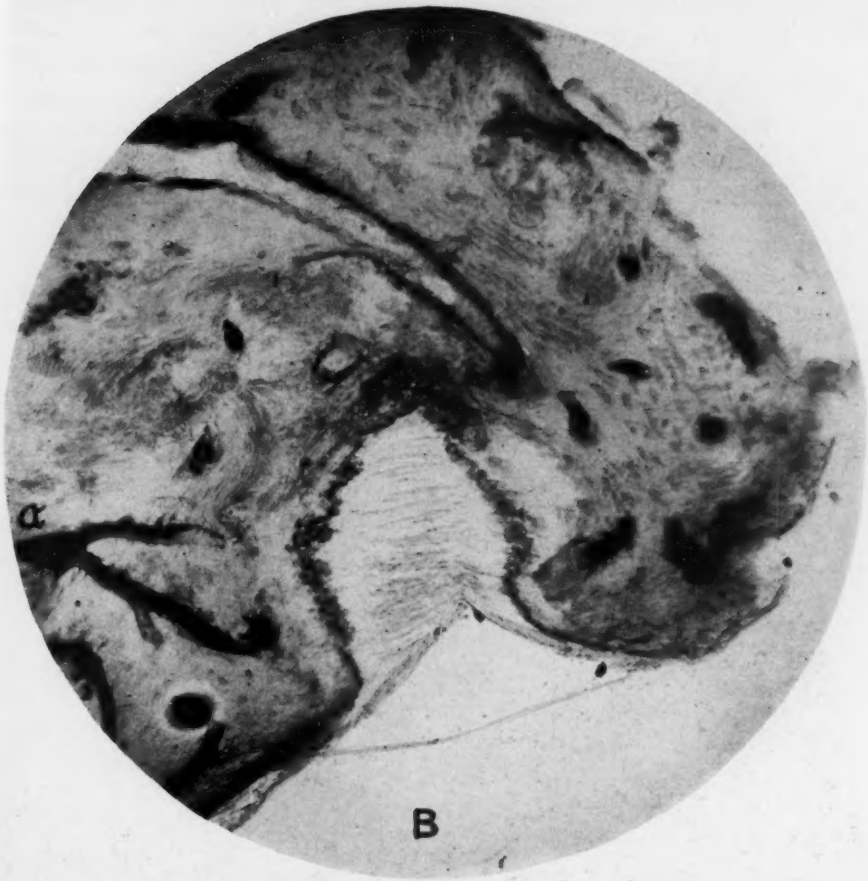
Fig. 8.—*A*, enlarged view of the cartilage-lined notch or pit which in cross section at its base appears as s
in figure 6 *B*.

C_2 and *D* of figure 13 callus formation in the descending process of the incus was suggestive of previous fracture. There was no correlative event in the history, such as possible occupational trauma.

Blue Mantles.—"Blue mantles" have long been described as a part of the microscopic picture of otosclerosis, although some investigators pay but little attention to them. The condition is characterized by deposits of calcium evidently of a slightly different chemical content than

sclerosis, blue mantles are numerous and c
spicuous. Figure 14 illustrates the vari
stages in the development of blue mantles. B
mantles are also frequently seen in tempo
bones which exhibit no foci of otosclerosis,
may be seen in figures 1, 3 and 4. Blue man
of markedly conspicuous type were observed
14 per cent of the cases of otosclerosis studi

Changes in the Marrow Spaces.—The marr
spaces showed various types of patholo
change. In ossicles in which there was no



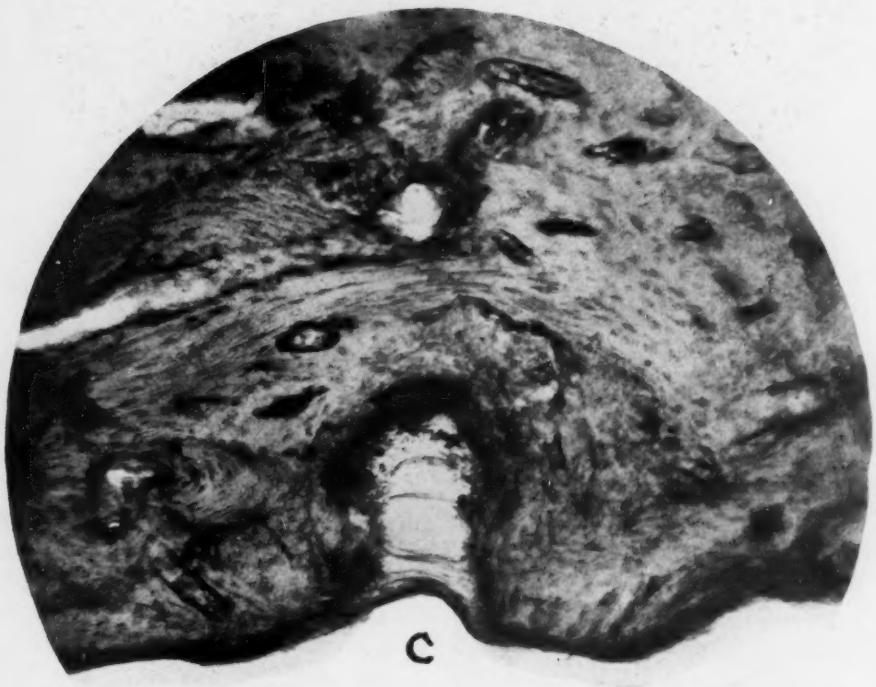


Fig. 8.—*B*, cartilage-lined notch: (*a*) Volkmann's canals. *C*, cartilage-lined notch.

Fig. 9.—*A*, fibrotic replacement of the descending process of the incus, a common lesion. The patient w
man aged 27 years. *B*, a detail of *A*; the arrows indicate Howship's lacunas.

Fig. 10.—Various degrees of fibrotic replacement of the lenticular process (arrows indicate Howship's lacunas): Howship's lacuna the site of beginning fibrosis. The specimen is from a man aged 35. The stapes was partly fixed. The blood calcium was 10.8 mg. and the phosphorus 3.4 mg. per hundred cubic centimeters. *B*, specimen from a woman 47 years old. The stapes was fixed. The blood calcium was 10.4 mg. and the phosphorus 3.6 mg. *C*, specimen from a 38 year old woman. Note the callus. The stapes was fixed. The blood calcium was 10.7 mg. and the phosphorus 8.3 mg. *D*, specimen from a 25 year old woman. The stapes was fixed. The blood calcium was 10.8 mg. and the phosphorus 3.4 mg.

Fig. 11.—Fibrotic replacement of bone in a malleus which had been nonfunctional for many years. The patient was a youth aged 16 years. The incus had been removed during a mastoidectomy when the patient was about 11 months of age. *B* is a detail from the upper part of *A*.

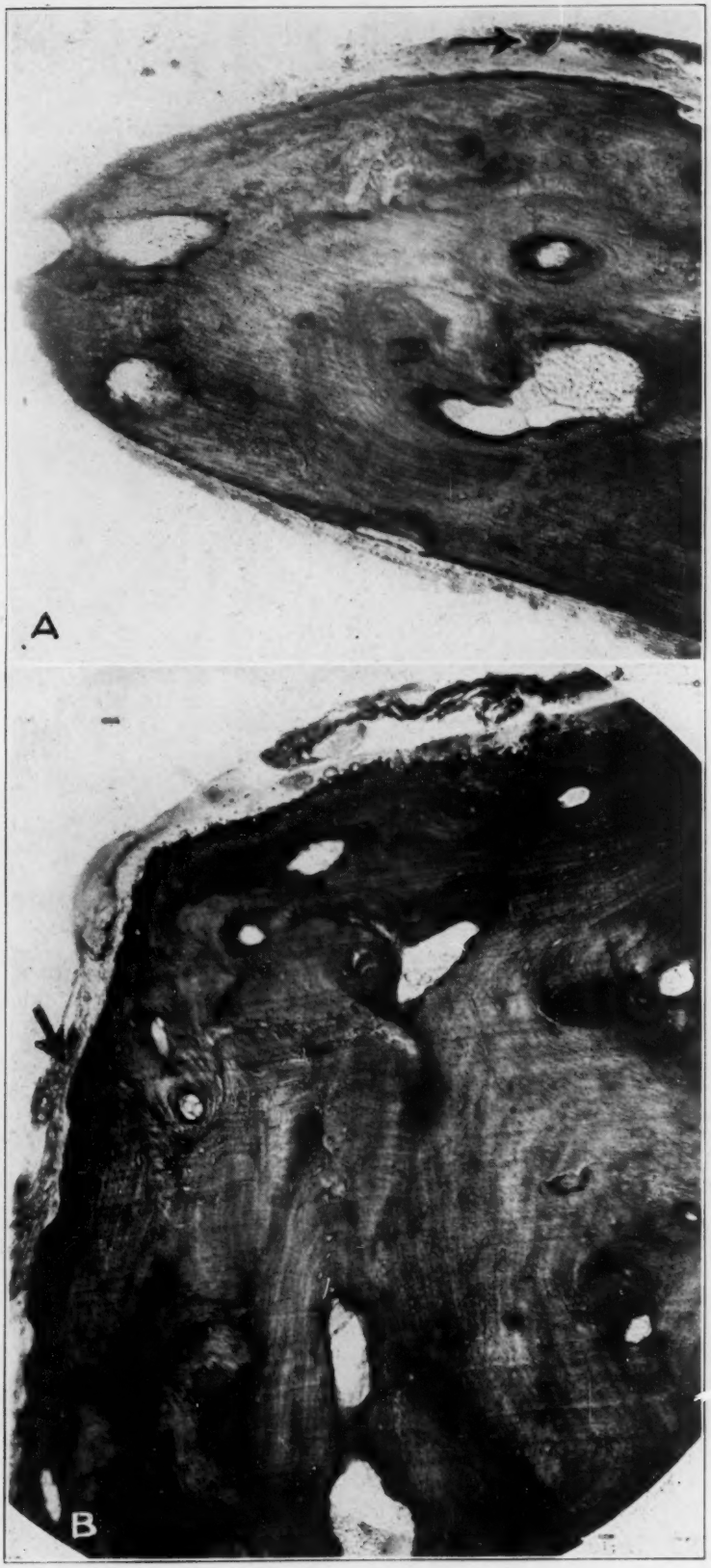


Fig. 12.—*A*, thin layer of bone deposited along the periphery of the mucosal covering of an ossicle (deposit calcium indicated by an arrow). The specimen is from a man of 32 years, whose blood calcium was 11 mg. phosphorus 3.1 mg. per hundred cubic centimeters. *B*, bone formed by accretion along the surface of an ossicle (arrow indicates new bone). This specimen is from a woman aged 33, whose blood calcium was 11.3 mg. whose phosphorus was 3.9 mg. per hundred cubic centimeters.

dence of a pathologic process, two types of marrow occurred: (1) the fatty type as illustrated in figure 15 *A* and (2) the hemopoietic type as illustrated in figure 15 *B*. The initiation of the degenerative changes in the marrow spaces appeared to be intimately related to the condition of the blood vessels.

(*a*) Tortuosity of Vessels: Most conspicuous among the early vascular changes was noted the tortuosity of the vessels. This occurred in 19 per cent of the cases. Figure 16 clearly illustrates this condition. Figure 17 shows the tortuous vessels as they lie in the body of a malleus. Here it seems evident that the condition is one of tortuosity as well as of multiplication of vessels.

Marked contrast in size between the arteriole and the venule is clearly depicted in figure 16 *A*, with a suggestion of early calcium plaques in the arteriolar wall. Further discussion of this case will be given under the heading "Correlation of Pathologic Changes with Clinical Histories."

(*b* and *c*) Venous Stasis and Arterial Conge tion: As is well illustrated in figures 16 a 17, the tortuous vessels frequently give rise arterial congestion and venous stasis. Veno stasis was observed in 31 per cent of the ca studied. Since this material was collected fr the living, there seems to be no question possible misinterpretation on this point; that the possibility of blood lying in the veins p mortem does not exist. Arterial congestion w observed in 14 per cent of the cases.

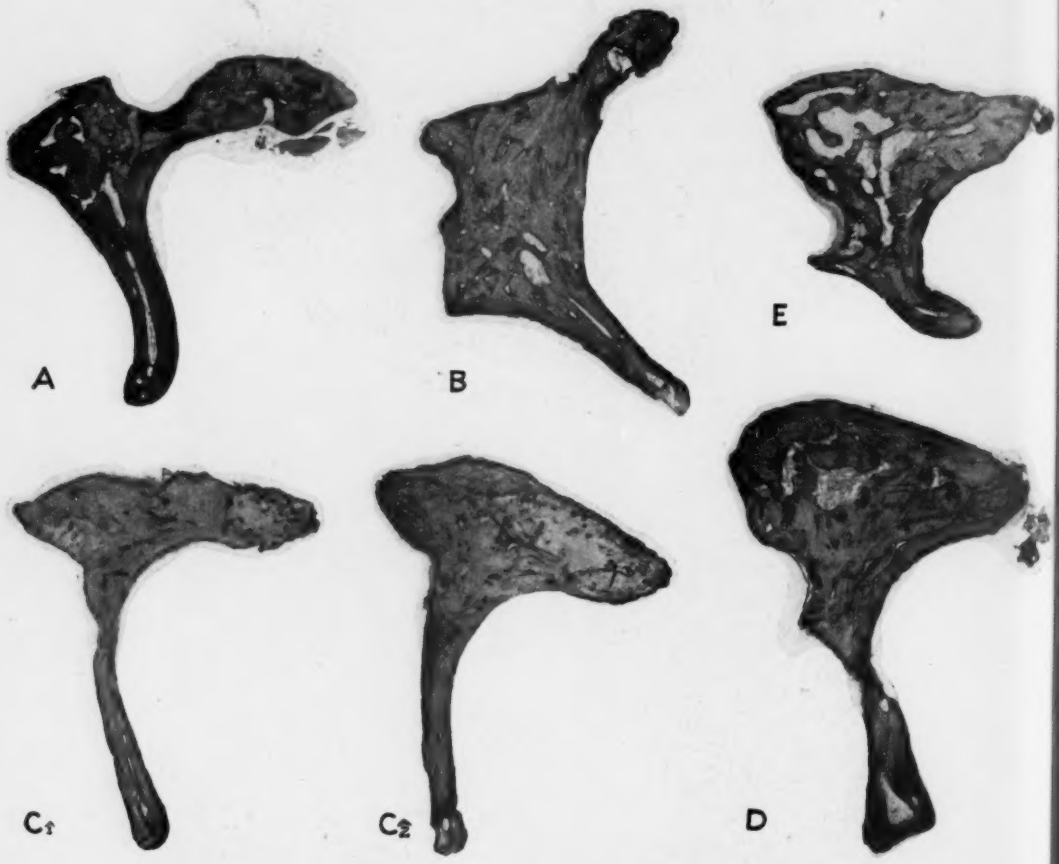


Fig. 13.—Distorted shapes seen in the incudes of 5 different patients. The distortion is most probably result of malfunction. The ages range from 28 to 39 years.

(*d*) Periarteritis: The tortuous vessels o served in the marrow spaces were frequently t location of the development of periarteritis su as is illustrated in figure 18. Periarteri occurred in 24 per cent of the cases. The co dition appeared to arise from stimulated activi of the outermost cells on the walls of the vesse as shown in figure 19 *B*. These cells becam fibroblasts and assumed a position with th long axes at right angles to the vessel walls a deposited fibrotic strands which eventually bou the thickened vessel wall in a matrix of co

Fig.

Fig. 14.—(*a*) Globuli interossei; (*b*) blue mantles on haversian canal walls; (*c*) Volkmann's canals.

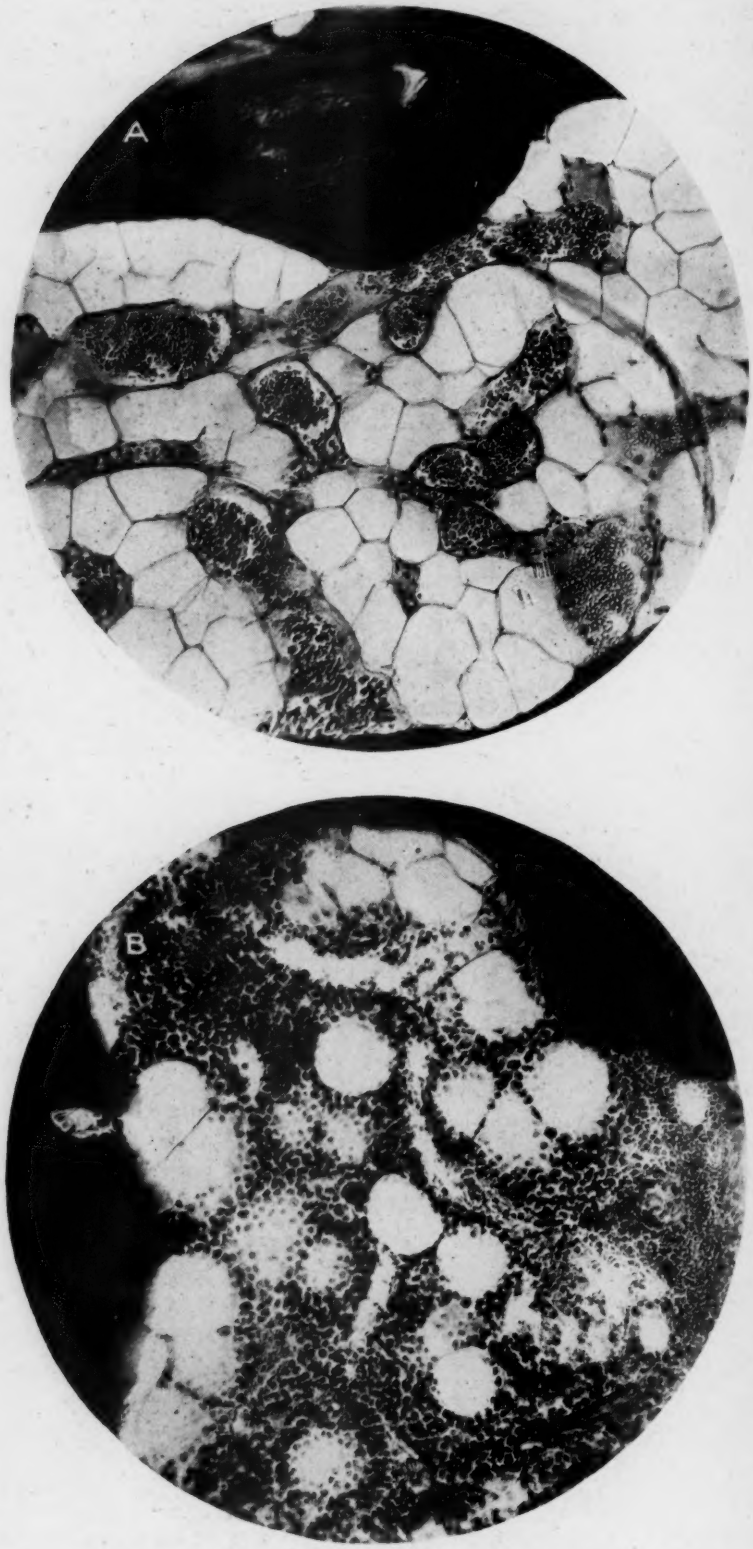
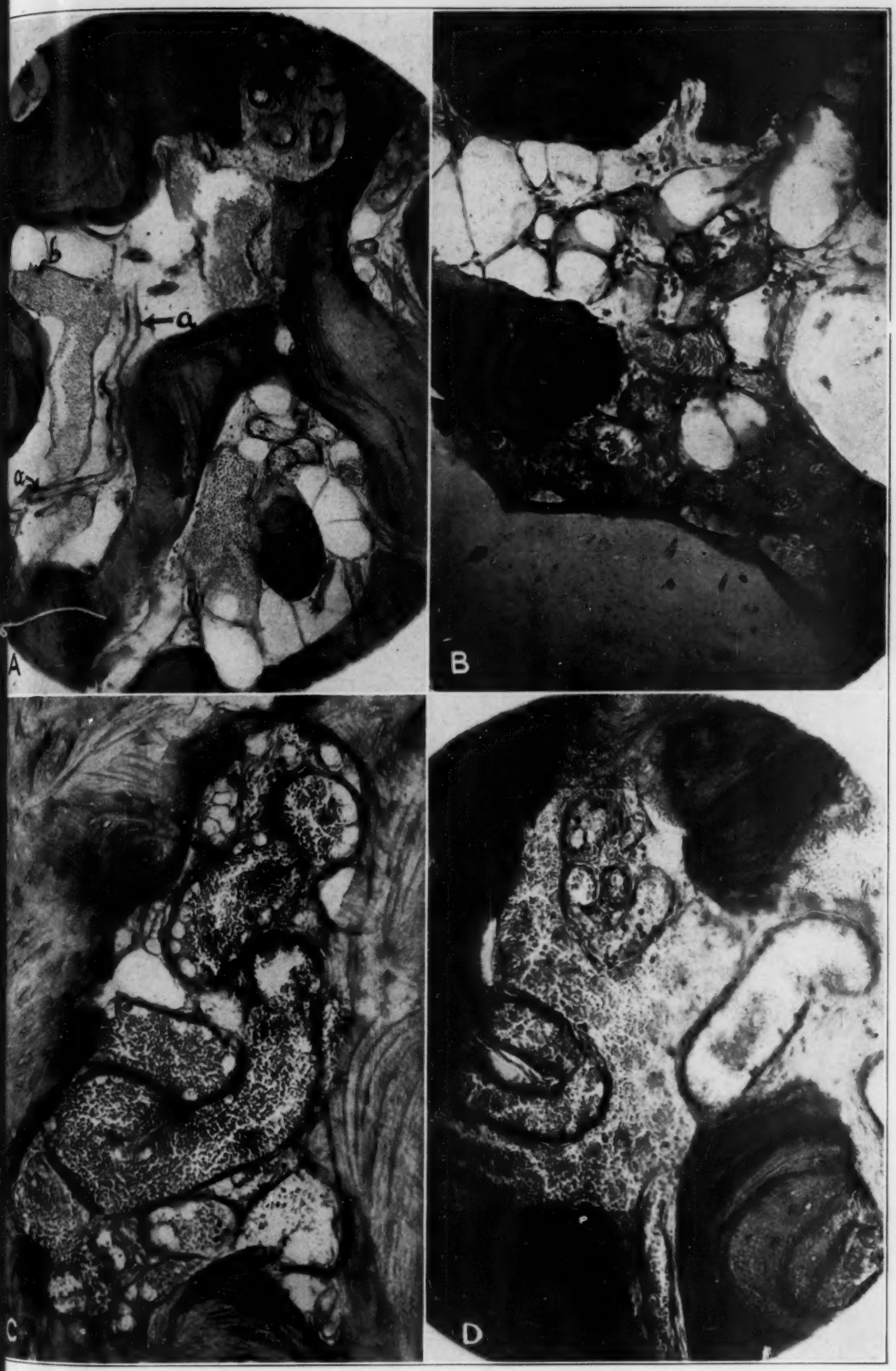


Fig. 15.—*A*, fatty type marrow, usually seen in these ossicles. This specimen is from a man 32 years of
B, hemopoietic type of marrow, occasionally seen. This specimen is from a woman 26 years of age.



ig. 16.—*A*, vessels in the ossicular marrow from a 33 year old woman. Note arteriosclerotic changes in rteriolar walls. *B*, stasis in the ossicular marrow from a 29 year old patient. *C*, tortuous vessels showing , a common finding in the ossicular marrow spaces. This marrow is from a patient aged 46. *D*, stasis in ssicular marrow from a 39 year old patient.

nective tissue to the neighboring bony wall. The ultimate result was fibrosis of the marrow cavity as seen in figure 19 *A*. Concomitant with this process, deposition of bone often occurred along the periphery of the marrow space. Obliteration of the marrow spaces up to a certain point is a normal process in the

(*e*) Endarteritis: Obliterative endarteri illustrated in figure 20 was also observed, this condition was rare. This type of patho change also initiated fibrosis of the ma spaces.

Fibrosis of the marrow spaces was obse in 17 per cent of the cases.

Fig. 17.—The usual location of the marrow space in the center of the body of the incus and extending the long process is shown in this specimen from a 39 year old patient. Tortuous vessels with stasis of blo present. The smaller vessels near the top of the marrow space suggest recent formation.

aging of ossicles. Fibrotic replacement of marrow when pathologic was often continuous with and a part of fibrotic replacement of bone as stated.

(*f*) Fragility Produced by Osteoporosis contrast to obliterated marrow spaces, very marrow spaces were observed in 14 per of the cases. These were sufficiently larg

duce an appearance of marked fragility when al sections were studied. Figure 21 illus- s some of the ossicles with extensive mar- spaces. No fractures were observed in these oporotic bones. Occasionally, as may be in figure 21 *B* and *C*, the marrow space roached perilously near the articular surface he ossicle, but no instance was observed in ch the intervening layer of thin bone had en down, thus interfering with articulation.

In some specimens the cartilage of the ossicles showed lipping and erosion such as is illustrated in figure 23 *A*. In others the hyaline layer of cartilage had been completely eroded as shown in figure 23 *B*. Deposition of calcium occurred not only in the interarticular disk as already described but over the whole joint cavity as illustrated in figure 24 or in the ligament of the joint as seen in figure 25.

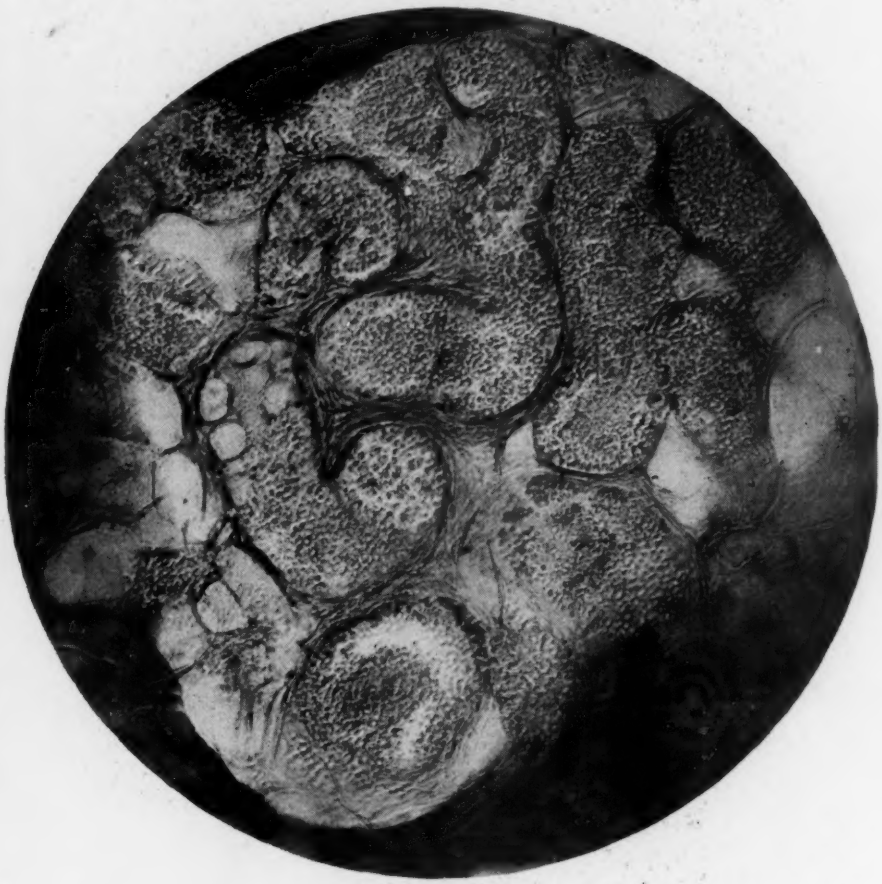


Fig. 18.—Periarteritis and tortuous vessels in a 32 year old patient who complained of vertigo.

athologic Changes in Ossicular Joints.—The oth layer of hyaline cartilage over a normal icular joint surface (figs. 3, 4 and 22 *A*) has ady been described. These joints undergo enerative pathologic changes just as do joints where in the body. In figure 22 *B* we see er layers of differentiated cartilage cells serv- as replacement layers than are apparent under normal hyaline layer of cartilage. Further- re, there is a deposition of calcium plaques out he interarticular disk.

Another type of joint change was manifest in the flattening of the joint surface. Various aspects of this process may be seen in the four ossicles shown in figure 26. That such changes cannot be ascribed to advancing senility is established by the fact that the persons from whom these ossicles were taken were 40, 47, 25 and 31 years of age, respectively.

An overgrowth of pathologic bone on the articular surface in a 40 year old man, whose stapes was found to be partially fixed at opera-

Fig. 19.—Marrow cavities obliterated first by fibrosis, then by deposition of bone.

is illustrated in figure 27 *A*. The evidence
ts to the probability that this was an active
ological process at the time of removal of
bone. An earlier stage of an apparently simi-

region of the oval window in the temporal bone removed at autopsy in cases in which the clinical diagnosis of otosclerosis was histologically verified.

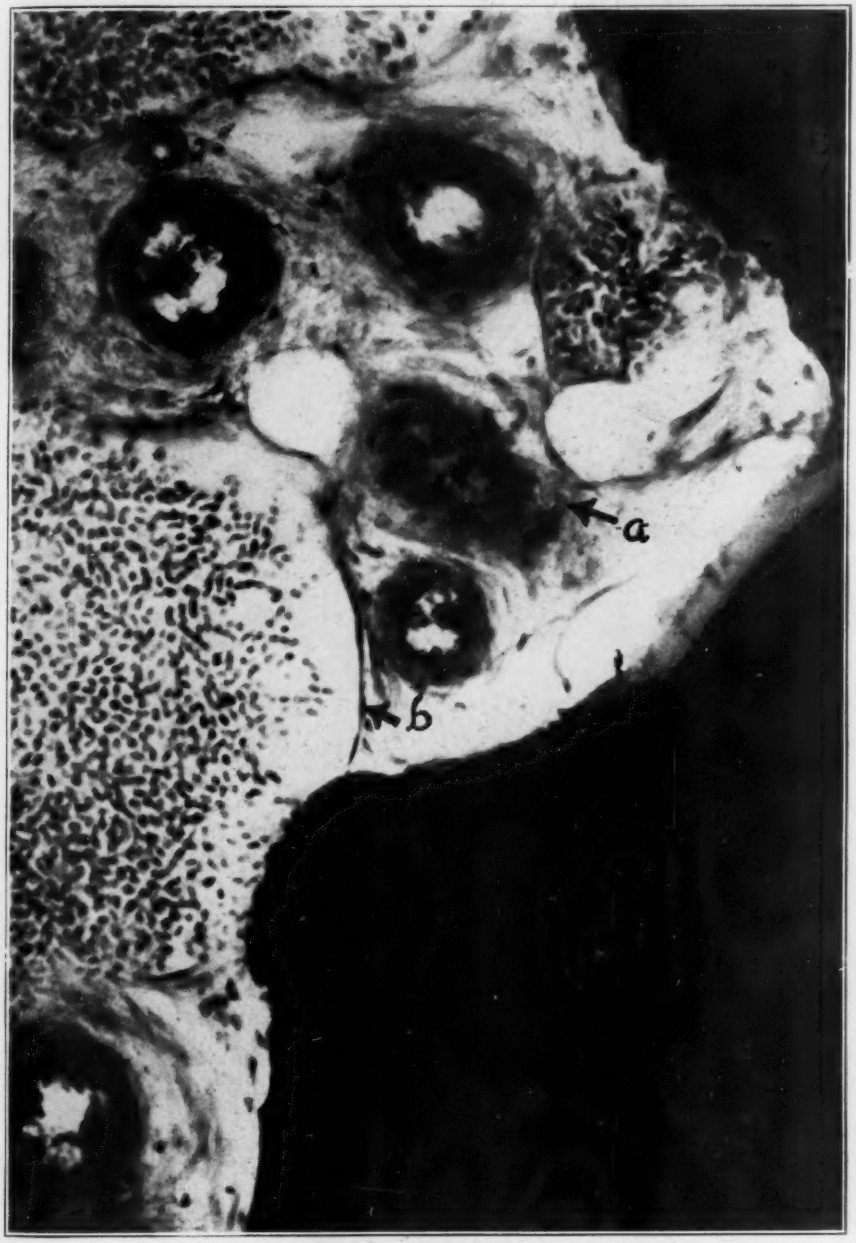


Fig. 20.—Obliterative endarteritis with periarteritis and venous stasis in a patient 32 years old: (*a*) obliterarteriole; (*b*) vein.

process is illustrated in figure 27 *B*. Here the
osit of atypical bone appears to be in an earlier
e of development. In neither case, however,
ere presented a pathologic picture similar to
of typical otosclerotic foci.
n no instance did the ossicles when examined
bit otosclerotic foci such as are seen in the

CORRELATION OF PATHOLOGIC CHANGES WITH CLINICAL HISTORIES

There is one outstanding case which tends to emphasize the influence which immobilization of the ossicular chain will have on the histologic aspect of the ossicles involved. Operative notes

Fig. 21.—Fragility produced by marrow spaces. Note that these spaces are in close proximity to the arti surface. *A*, incus of a patient 36 years old; the blood calcium was 10.1 mg., the phosphorus 3.8 mg., per hu cubic centimeters. *B*, incus of a patient 37 years old; the blood calcium was 10.6 mg. and the phosphoru mg. *C*, incus of a patient 39 years old; the blood calcium was 10.7 mg. and the phosphorus 3.2 mg. *D*, of a patient 42 years old; the blood calcium was 10.6 mg. and the phosphorus 3.9 mg.

the case illustrated in figure 11, which shows ost total replacement of bone in the head of malleus by fibrotic tissue, state that no incus present when the aditus was opened. It had ently been accidentally removed during stoidectomy, performed when the patient was months old. Following the mastoidectomy e was deafness in that ear. For a period of enteen years therefore (the patient now being years of age) the ossicular chain had been obilized. The malleus had undergone the tic replacement characteristic of long bones ch are immobilized for extensive periods

presented in the accompanying table. A fixed stapes was reported in 22 of the 27 cases. In 3 cases the stapes were partially movable, and in 2 its state was unreported.

Since irregular bony contours were found frequently to be initiated by fibrotic replacement and the cases of it to overlap that group somewhat, a similar study was made of this series. In 34 cases of 57 in this group the stapes was definitely fixed when tested on the operating table.

Although we were obviously dealing with removal of calcium in these cases, a complete

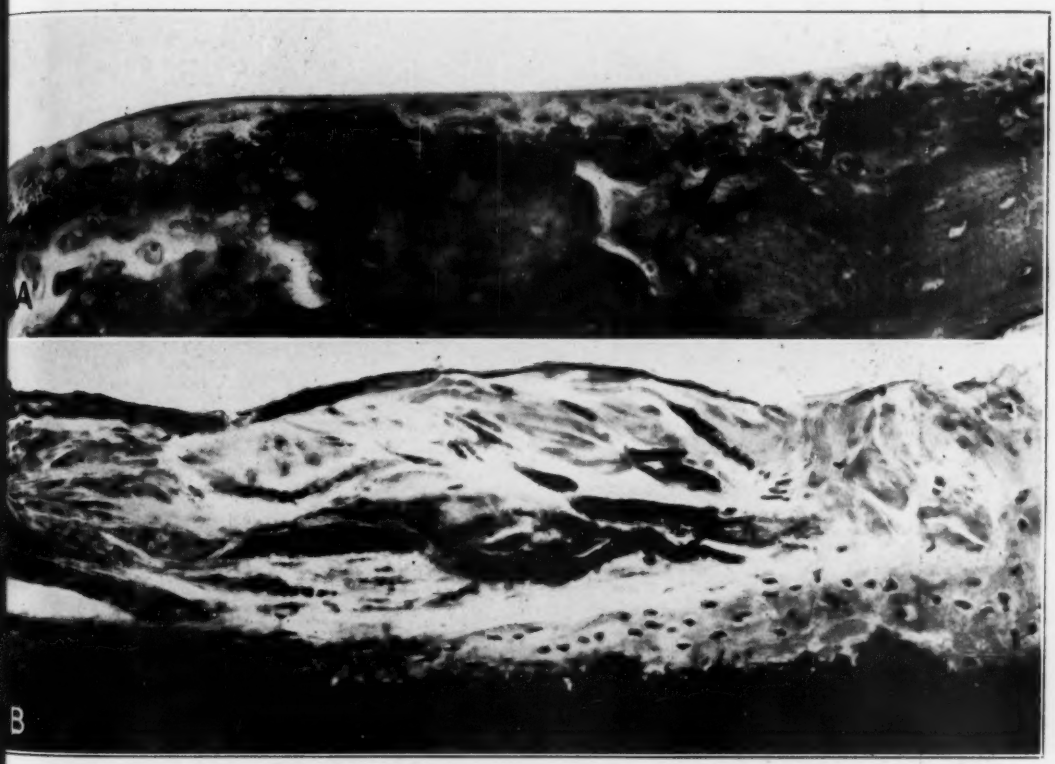


Fig. 22.—*A*, normal articular surface of an ossicle, showing the three layers of cartilage and the irregular underlying bony surface. *B*, a joint surface in which the replacement layers of cartilage are less active and in which calcium plaques have been deposited in the ligament.

where in the body. This particular pathologic ure could definitely be ascribed to a process lated to the otosclerotic process which later ared in this subject. Nevertheless, this type athologic change, found less extensively in whole series of cases, may also be a result stapedial ankylosis. More or less extensive tic replacement similar to that illustrated in res 9 and 10 occurred in 27 cases. These cases e checked as to operative notes in regard to tion of the stapes and age, with the results

survey of the blood calcium and phosphorus of the 115 patients yielded no correlative information.

A second instance in which the microscopic findings may be ascribed to pathologic conditions unrelated to otosclerosis is that illustrated in figure 16 *A*. The microscopic report read as follows:

It is probably not without significance that in this case neither malleus nor incus presents the usual depth of cartilaginous articular surface. This area is exceed-

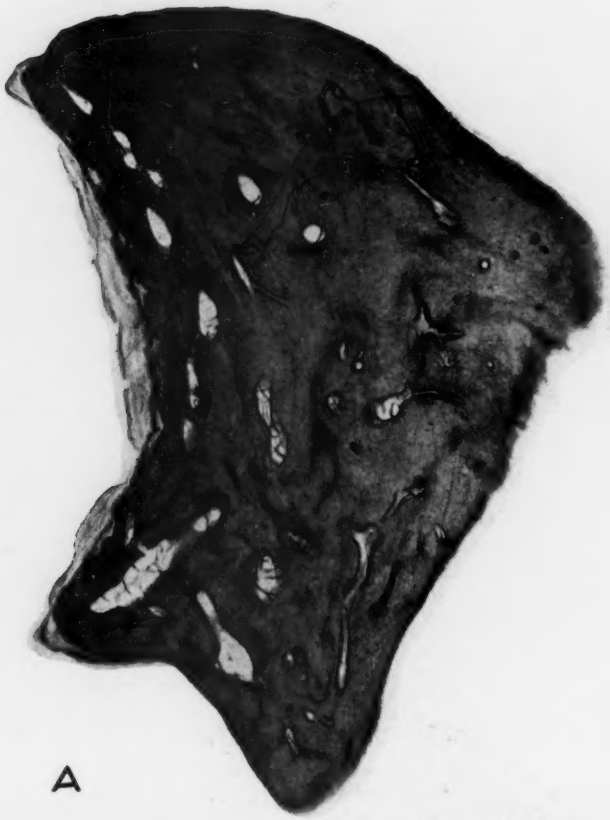


Fig. 23.—*A,* lipping of articular cartilage. *B,* erosion of articular cartilage. Compare with the normal ca in figure 22 *A.*

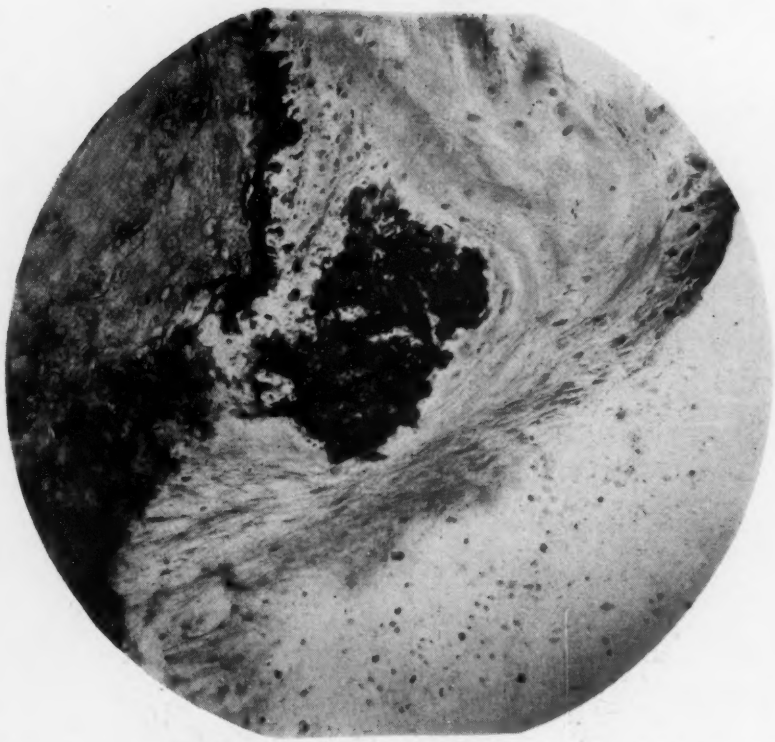


Fig. 24 (upper).—Incus with a bony plaque extending over the joint cavity. This specimen is from a man of 52 years.

Fig. 25 (lower).—Deposition of calcium in the ligament of the incus of a 58 year old patient.

ingly thin on both ossicles and not as irregular as in many specimens. That is, there is no heaping up of cartilage cells with isolated cells lying peripherally as in some cases.

arteriolar walls, a point overlooked in t
scopic report. A review of the cas
yielded the information that arthritis h

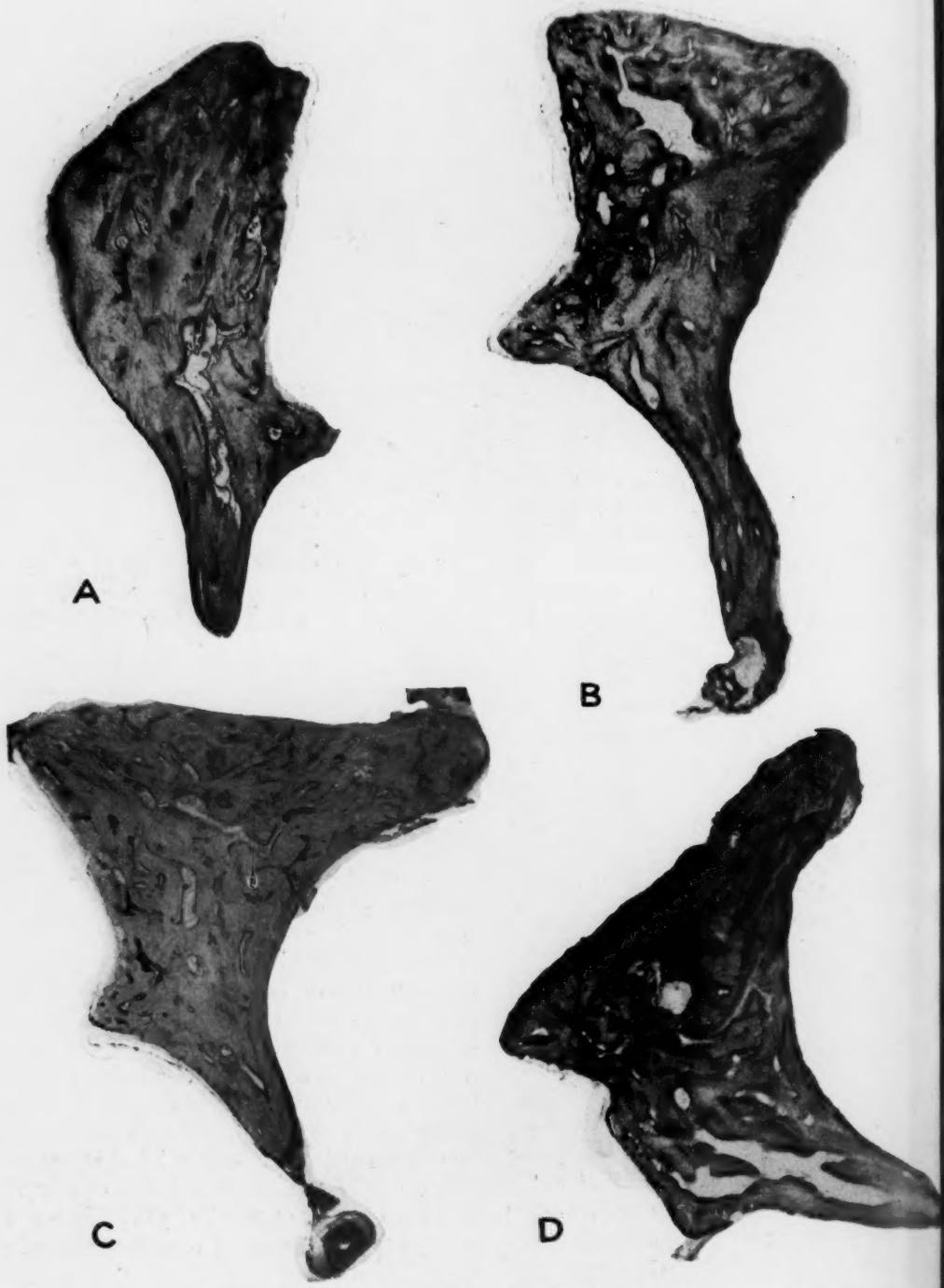


Fig. 26.—Incudes with flattened articular surfaces: *A*, aged 25 years; *B*, 31 years; *C*, 40 years; *D*, 4

The marrow from this case, as shown in figure 16 *A*, demonstrated the marked contrast in size between arterioles and venules in the area. The photomicrograph reveals early sclerosis of the

oped in this patient, with marked distort
the joints. On further questioning the p
stated that she had had arthritis prior
fenestration operation but that the disea
quiescent at that time.

Fig. 27.—*A*, overgrowth of new bone on the articular surface of the incus in a man 40 years old. At operation the stapes was found partially fixed. This fact coupled with the picture probably indicates that the disease process is active. *B*, probable early stage of lesion similar to that seen in *A*.

It is interesting to note that in this 33 year old woman with generalized disease of the joints a thinning of the hyaline cartilage layer of the ossicular joint should be observed, as well as early arteriosclerosis.

A third and less obvious case is that of a 27 year old woman whose ossicles showed patho-

Fibrotic Replacement in Ossicles in Relation to Fixation of the Stapes

Number	Stapes	Age	Blood Calcium, Mg. per 100 Cc.	Blood Phosphorus, Mg. per 100 Cc.
1 (5)	Fixed	37	10.6	3.4
2 (16)	Fixed	29	10.9	3.4
3 (17)	Fixed	33	10.8	3.2
4 (18)	Fixed	47	11.1	3.0
5 (22)	Fixed	46	11.6	3.0
6 (23)	Fixed	26	10.9	3.7
7 (24)	(No statement)	28	10.2	3.7
8 (26)	Fixed	49	10.8	3.9
9 (28)	Fixed	29	10.7	3.5
10 (40)	Partially fixed	42	10.8	3.2
11 (53)	Fixed	43	10.9	3.6
12 (56)	Fixed	42	10.7	3.9
13 (61)	Fixed	30	11.1	3.0
14 (65)	Fixed	31	10.9	3.2
15 (67)	Fixed	16	11.2	3.4
16 (66)	Fixed	29	10.7	3.4
17 (75)	Partially fixed	27	10.8	3.2
18 (77)	Fixed	25	10.8	3.4
19 (78)	Partially fixed	39	10.7	3.2
20 (80)	(No statement)	24	11.0	3.9
21 (85)	Partially fixed	34	9.8	Not stated
22 (101)	Partially fixed	28	Not stated	Not stated
23 (115)	Fixed	30	11.2	4.1
24 (132)	Fixed	34	10.9	4.0
25 (6)	Fixed	35	10.8	3.7
26 (2)	Fixed	37	10.9	3.7
27 (113)	Fixed	33	11.3	3.9

logic joint surfaces. The cartilage layer was exceedingly thin in places and entirely lacking in others. The case history stated:

> . . . this patient had a slight systolic murmur with slight accentuation of the second pulmonic sound, evidently a mild degree of mitral insufficiency. . . . The patient definitely denies having any rheumatic manifestations.

A fourth case may be cited in which arteriosclerotic changes were noted in the walls of vessels in the marrow spaces. The vessels were exceedingly tortuous and showed stasis. The patient was a 54 year old man who suffered occasional attacks of an epileptic nature. The calcium content of the blood was 10.8 mg.; the phosphorus content, 3.4 mg.; the blood pressure was 150 systolic and 98 diastolic. Whether his seizures could have had any relation to the calcium imbalance cannot be stated from the information available.

SUMMARY

Microscopic study of the incus and the head of the malleus in cases of stapedial ankylosis yielded the following data:

Pathologic changes were found in all but 5 cases. Typical otosclerotic foci, such as are seen in the region of the oval window in the temp bone removed at autopsy in cases in which clinical diagnosis of otosclerosis has been h logically verified, were not found. The pa logic changes observed were:

1. Distortion in the shapes of the ossicles due
   (*a*) Irregular bony contours (57 per cent o cases)
   (*b*) More or less extensive fibrotic replace of bone (23 per cent of the cases)
   (*c*) Evidence of altered stresses and strai the ossicular chain
2. Blue mantles
3. Changes in the marrow spaces which included
   (*a*) Tortuosity of vessels
   (*b*) Venous stasis
   (*c*) Arterial congestion
   (*d*) Periarteritis
   (*e*) Fibrosis contributing to the gener fibrotic replacement of the bone
4. Pathologic changes in the ossicular joints, included:
   (*a*) Erosion of cartilage
   (*b*) Lipping of cartilage
   (*c*) Deposition of calcium
   (*d*) Overgrowth of atypical bone

COMMENT

Certain relatively recent observations o sions of bones in general have added cons ably to present knowledge of this compli subject. Decalcification from disuse is a served phenomenon and an established fact. infantile paralysis there may be an extrem gree of skeletal decalcification" (Wa Jones).[5]

Decalcification from disuse has been de strated in our study, particularly in the ca the malleus from whose ossicular chain the had been removed many years previously seems highly probable, also, that in the la percentage of the pathologic ossicles in the series from otosclerotic patients changes are in part at least degener changes arising from disuse engendered ankylosis of the stapes. No correlation found in regard to blood values for calcium phosphorus. When blood calcium appeared relatively high there was not a corresp drop in phosphorus. Phosphatase was not mined. It is improbable that a lesion so m in the skeletal system could be associated any significant changes in the blood pictur less the disease is systemic.

5. Jones, R. W.: Fractures and Other Bon Joint Injuries, Baltimore, Williams & Wilkins pany, 1940.

Ankylosis of the stapes was demonstrated, ever, by manual manipulation in most of se cases. It is, furthermore, not improbable lesser degrees of ankylosis may exist in those cases in which the stapes still seemed to be ially movable. Mobility created by sound es is admittedly of a much finer order than created by hand. Ankylosis may already been present to a degree which would pre- sound waves of lesser intensity. We are ad- edly dealing with a chain of bones which nally is in almost constant activity. Cessation his normal state, particularly in young per- in whom blood supply is still active, may the stage for decalcification and fibrotic re- ement.

affe[6] clearly demonstrated that resorption of may occur in three possible ways. These are: by presence of blood vessels and granula- tissue, (2) by action of osteoclasts, (3) by steresis with the production of Howship's nas.

e considered osteoclastic activity of minor ortance, although admitting that it gives a king microscopic appearance when present. oclasts were not found in these ossicles.

he irregular bony contours so commonly rved by us in our series of ossicles were uently produced by the development of ship's lacunas.

arly stages in decalcification produced by d vessels appeared to be initiated in the row spaces, where exceedingly tortuous and ably supernumerary vessels were observed. ill be recalled from the text and the photo- graphs that vasodilatation and venous stasis frequently observed. According to Wat- Jones,[5] the vasodilatation and hyperemia are ed by liberation of histamine and acetyl- ine. Whether the decalcification is due actually to changed p_H or lactic acid locally produced or to changed carbon dioxide tension (Jaffe[6]) we do not know.

Chandler[7] stated that the relation of bone to circulation is one of nutrition, growth and necrosis. Necrosis of an aseptic type may occur in bone if the blood supply has been cut off. Such necrosis, if occurring near the joint surface, will affect the joint, since the cartilage of the joint is nourished by synovial fluid and tissue fluid coming from the circulation of the underlying bone (Phemister[8]). It has already been stated that the ossicles must of necessity have minute end arteries. Areas of necrotic bone cells, empty lacunas and pathologic joint surfaces were found in these ossicles.

While calcium is resorbed in highly vascular areas, it is deposited in avascular areas. Deposition of calcium plaques in some of these joint surfaces was observed.

Calcium was also deposited by accretion over the old contour of the ossicle, thus rendering the contour irregular by another method than that previously described (formation of Howship's lacunas).

In a few instances calcium plaques were deposited peripherally in the connective tissue of the mucosa covering the ossicles.

Atypical bone was deposited near the joint surface in some cases, as illustrated in figure *27 A* and *B*. From what is known of pathologic involvement of bones in general, one may assume that this pathologic deposition of bone was the result of interference with the normal blood supply.

Dr. L. A. Schall granted use of the Mosher Laboratory for the preparation of specimens.

Jaffe, H. L.: The Resorption of Bone, Arch. 20:355-385 (March) 1930.

7. Chandler, F. A.: Observations on Circulatory Changes in Bone, Am. J. Roentgenol. **44**:90-97, 1940.

8. Phemister, D. B.: Changes in Bones and Joints Resulting from Interruption of Circulation, Arch. Surg. **41**:436-472 (Aug.) 1940.

HYPERPLASTIC SINOPHARYNGOSTOMATITIS

A MANIFESTATION OF BORDERLINE ALLERGY RESULTING IN FETOR EX ORIS, SNORING AND GLOBUS HYSTERICUS

NOAH FOX, M.D., AND ROBERT G. KESEL, D.D.S.
CHICAGO

In a previous article [1] it was pointed out by Fox and associates that nasal allergic conditions occur which, because of their subclinical character, go unrecognized as of allergic nature. These borderline nasal allergies occur in persons who have or have had other frank allergic manifestations and who come from allergic families. Further, these patients reveal cutaneous sensitivity to particular proteins, especially inhalants, and respond to hyposensitization with these proteins.

One of the syndromes described consisted of nasal obstruction, occurring usually on one side or the other, i. e., intumescence, especially bad during sleeping hours, associated with postnasal drip and accumulation of mucus in the pharynx on arising. It was pointed out that the patients had a pharyngeal lymphoid diathesis, diffuse in children and lateral in adults.

To this picture we wish to add other symptoms and the oral findings characteristic of these patients, who present a similar type of hyperplastic stomatitis with coating of the tongue and fetor ex oris.

Many types of stomatitis have been described by various authors,[2] including catarrhal, aphthous, herpetic, ulcerative, gangrenous, mycotic, mercurial and gonorrheal types. The authors cited have stated that the various forms of stomatitis may be the result of many factors working singly or collectively, locally or systemically. These include: lack of oral cleanliness, undernourishment, acute infections (for exam measles, scarlet fever and diphtheria), irrita chemicals, excessive use of spices and tob gastrointestinal disturbances, carious te poorly made dental restorations, metallic poi diabetes, pregnancy, blood dyscrasias and terial infections of the mouth, such as t caused by the fusospirochetal organisms.

A search of the literature failed to brin sight a description of the ordinary chronic ing of tongue and mouth seen in the person part of the time or all of the time bre through the mouth, although Mead, under heading "Lingua Alba" describes a cond in which the "epithelium and papillae of tongue become a dull white, but there is no a fur. It is sometimes associated with ch intestinal dyspepsia and a bad taste in the m preceding the attack." Obviously, this cond resembles the stomatitis associated with allergy.

Lain,[3] in summarizing oral lesions, menti the importance of allergic factors, but he ha mind the oral lesions of contact allergy, tha ulceration and acute edema caused by d restorative materials.

In the literature on fetor ex oris a p evaluation of the nasal factor is entirely looked, the principal emphasis being lai carious teeth, periodontal pockets and bad d care. However, this type of stomatitis occu all people with nasal allergy and is extre common.

PATHOLOGIC OBSERVATIONS

Grossly, the tongue is covered by a yell gray coating, which is particularly heavy the middle and posterior thirds but al present over the gingival and buccal surfac the mouth. The fungiform conical and v papillae of the tongue become enlarged, infl and sensitive. The lymphoid apron over pharyngeal portion of the tongue, like the l pharyngeal lymphoid tissue, becomes swolle

This study was aided by a grant from the White Laboratories.

From the Department of Laryngology, Rhinology and Otology of the University of Illinois College of Medicine, and from the Department of Therapeutics and Oral Pathology of the University of Illinois College of Dentistry.

1. Fox, N.; Harned, J. W., and Peluse, S.: Borderline Allergy: Its Relation to Hyperplastic Disease of the Respiratory Tract, Arch. Otolaryng. **31**:502 (March) 1931.

2. Thoma, K.: Oral Pathology, St. Louis, C. V. Mosby Company, 1944. Mead, S. V.: Diseases of the Mouth, ed. 5, ibid., 1940. Prinz, H., and Greenbaum, S. S.: Diseases of the Mouth and Their Treatment, ed. 2, Philadelphia, Lea & Febiger, 1939.

3. Lain, E. S.: Lesions of Oral Cavity Caus Physical and by Physicochemical Factors, Arch. mat. & Syph. **41**:295 (Feb.) 1940.

dened and often contains material in its tiny pts. There are associated congestion and icosity of the veins of the tongue in this ion. In severe cases the gums may be swollen tender and may bleed on slight pressure.

Microscopically, the epithelium reveals hyper-ia, as indicated by an increase in all the con-tive tissue elements. This is particularly ceable about the papillae, where the epi-ium is especially thickened. The lymphoid e over the pharyngeal portion of the tongue eals an immense increase in the lymphoid ents and extensive vascularization of that t.

BACTERIAL FLORA OF THE MOUTH

Kliger [4] noted that 75 per cent of the bacterial a of the mouth consisted of cocci, 40 per cent hese being streptococci. Bibby [5] called atten-to the relatively high percentage of gram-tive cocci in the healthy mouth. The Thom-[6] concluded from their investigations that green-producing cocci, variously known as ptococcus salivarius, Streptococcus viridans lpha streptococci, were the commonest type. undifferentiated or gamma type is also ent in large numbers. The beta hemolytic on the other hand, is rarely found except g an acute pathologic state. Other organ-noted in the mouth include gram-positive negative bacilli, Leptotrichia, Actinomyces, ilias, endamebas, trichomonads, vibrios, fusi-bacilli and spirochetes.

ultural studies of the mouths of over 200 nts suffering from hyperplastic rhinophar-stomatitis have revealed that the alpha ptococcus count frequently rises as high as 83 cent of the total culturable flora. Smears, cially those of material from the tongue, this organism in almost pure culture. As condition improves and the tongue clears, cocci, particularly Micrococcus catarrhalis the gamma type of streptococcus, appear in r numbers, although their numbers never ed that of the alpha type, or S. salivarius. exhaled carbon dioxide, combining with ral debris and lowering the p_H, may be the r responsible for the rapid change of the rial flora of the mouth.

Kliger, I. J.: A Biochemical Study and Differen-of Oral Bacteria, J. Allied Dent. Soc. **10**:141, and 445, 1915.

Bibby, B. G.: Comparison of Flora of Different th, J. Dent. Research **17**:423, 1938.

Thomson, D., and Thomson, R.: Research on the of Streptococci in Oral and Dental Sepsis, Ann. n-Thomson Lab. **5**:1, 1932.

SYMPTOMS

As described elsewhere, the symptoms of perennial borderline nasopharyngeal allergy include nasal obstruction, which is complete when the patient is lying on the back, and partial when he is lying on the side or when he is in the upright position. This condition is associated with postnasal drip, due to exudation and transudation from the nose and the posterior sinuses. When the patient is in the upright position, this exudate by-passes the pharynx and drops into the esophagus, but when he is lying on the back, as during sleep, it accumulates in the pharynx and the larynx and is coughed up on arising. The result of the enzyme action of the exudate bathing the pharyngeal lymphoid tissue during the sleeping hours is observed in the sore throat and cough from which the patient suffers in the morning.

The nasal closure during sleep causes the patient to breathe in part through the mouth. This results in snoring — a symptom characteristically present only when the mouth is open. The air passing through the mouth also causes drying of these tissues with the result that there are bad taste and fetor ex oris on arising. These effects, though noted in the patient subject to mouth breathing, may develop in a few hours in the person suffering from nasal obstruction and mouth breathing due to a head cold. This train of symptoms disappears entirely on resumption of nose breathing.

If a scraping is made from the heavily coated tongue, the same odor will be noted as is responsible for the fetor ex oris from which the patient suffers. When sponginess and inflammation of the gums are present, as frequently is the case, some bleeding occurs, causing a more severe fetor, which probably is due to proteolysis of the extravasated blood.

In the highly nervous person, particularly a woman, globus hystericus is frequently present. Because of the ever present involvement of the posterior pharyngeal mucosa in the patient with a low threshold of stimulus, the pharyngeal constrictors beneath remain in tonic contraction. Since the function of these muscles is to propel food down the pharynx, the patient constantly has a feeling of a bolus in the throat, which she tries to swallow.

TREATMENT

The treatment of this condition is directed primarily toward alleviation of the allergic diathesis. Unless the nose is rendered patent, symptomatic treatment is only of fleeting value. Patency can be restored by proper hyposensitization after a foreign protein survey, together with the usual prophylactic measures against an offending

environment. While awaiting the results of hyposensitization, symptomatic treatment should be instituted.

The submucosal injection of various obliterants, such as sodium morrhuate and Sylnasol (a 5 per cent solution of the sodium salts of the fatty acids of psyllium seed), causes enough temporary constriction frequently to tide the patient over the period preceding successful hyposensitization. Submucous coagulation and cauterization likewise may be of temporary aid.

The pharyngeal symptoms — that is, irritation, cough and globus hystericus — usually are relieved by sedatives. Six roentgen treatments giving a total of 2 erythema doses, equally divided over a period of three weeks, usually will relieve the pharyngeal symptoms for a period of from six to twelve months.

There is an old adage that snoring will stop if the person is rolled over on one side. The truth of this saying is demonstrated in the person with nasal allergy. Turning the patient on his side causes the nostril on the opposite side to become patent because the blood gravitates to the side on which the patient is lying. Inasmuch as the patulous nostril allows sufficient air to pass through the nose, the mouth closes, and snoring is therewith brought to an end.

Prevention of an overgrowth of organisms in the mouth breather is indeed difficult. Instructing the patient to tape his mouth for sleeping hours and to sleep on his side may lessen somewhat the bad morning taste and fetor ex oris.

Because S. salivarius by far outnumbers the other coccal types, an effort must be made to eliminate this organism. Although in vitro experiments with sulfathiazole in the concentration of 20 mg. per hundred cubic centimeters of blood failed to inhibit this organism, concentrations of 60 to 70 mg. per hundred cubic centimeters of blood retard its growth considerably in vivo.[7] The chewing of a gum tablet containing sulfathiazole for one hour four times daily at three hour intervals usually reduces the S. salivarius count greatly within four days. Other coccal forms will also be reduced in count.

The results obtained on the total oral flora and on S. salivarius in particular in 40 patients who chewed sulfathiazole gum for from one to four days are tabulated in the accompanying table. They may be roughly summarized as follows: The total oral flora was reduced in 32 patients (80 per cent of the total number); in 5 patients there was an increase — not entirely counted for; the number of S. salivarius reduced in 35 patients; in 5 there was an crease; a decrease in the S. salivarius coun 75 per cent or better was realized in 23 patie The cultures were grown on human blood a medium.

Counts of Oral Bacteria of Forty Patients Before After Sulfathiazole Gum Therapy

Patient	Total Bacteria Count per Cubic Centimeter		S. Salivarius Count per Cubic Centimeter		De In
	Before Sulfathiazole Gum Therapy	After Sulfathiazole Gum Therapy	Before Sulfathiazole Gum Therapy	After Sulfathiazole Gum Therapy	
1	18,000,000	59,000,000	7,200,000	0	
2	56,000,000	20,000,000	22,400,000	3,000,000	
3	30,000,000	670,000	18,000,000	0	
4	49,000,000	1,900,000	4,900,000	380,000	
5	400,000,000	80,000,000	200,000,000	40,000,000	
6	27,000,000	1,200,000	5,400,000	600,000	
7	250,000,000	900,000	75,000,000	0	
8	106,000,000	1,300,000	53,000,000	195,000	
9	300,000	47,000,000	30,000	0	
10	800,000	17,500,000	320,000	7,000,000	
11	4,000,000	1,400,000	400,000	0	
12	24,100,000	13,300,000	4,100,000	2,300,000	
13	135,000,000	2,300,000	13,500,000	690,000	
14	371,000,000	116,000,000	277,000,000	46,000,000	
15	12,100,000	2,100,000	1,810,000	420,000	
16	475,000,000	6,300,000	190,000,000	2,520,000	
17	13,000,000	5,400,000	9,740,000	3,510,000	
18	13,500,000	7,000,000	4,050,000	2,100,000	
19	22,000,000	10,600,000	3,960,000	3,440,000	
20	22,000,000	14,300,000	15,500,000	6,900,000	
21	160,000,000	100,000,000	96,000,000	58,000,000	
22	320,000,000	15,000,000	192,000,000	14,300,000	
23	76,000,000	93,000,000	60,000,000	69,700,000	
24	110,000,000	22,800,000	22,000,000	8,440,000	
25	4,100,000	2,900,000	1,600,000	580,000	
26	36,000,000	5,000,000	12,000,000	1,000,000	
27	15,000,000	14,000,000	3,000,000	700,000	
28	86,000,000	94,000,000	25,800,000	4,700,000	
29	8,000,000	113,000,000	2,000,000	5,700,000	
30	10,200,000	53,000,000	3,000,000	23,800,000	
31	76,000,000	144,000,000	62,000,000	69,000,000	
32	1,050,000	700,000	300,000	35,000	
33	250,000,000	2,000,000	87,500,000	1,100,000	
34	40,000,000	1,000,000	26,000,000	200,000	
35	624,000,000	20,000,000	293,000,000	8,000,000	
36	201,000,000	49,000,000	110,000,000	27,000,000	
37	107,000,000	4,000,000	37,500,000	3,000,000	
38	231,000,000	227,000,000	93,000,000	45,400,000	
39	13,000,000	5,400,000	9,750,000	4,000,000	
40	4,000,000	1,000,000	1,000,000	200,000	

Simultaneously with the change in the flora, the fetor disappeared, although it ret on cessation of the sulfathiazole therapy. little of the sulfathiazole is absorbed in the ing process, and 3 or 4 tablets daily suff keep the mouth free of fetor, we unhesita allow the patient to continue this treatme long periods. Some of our patients have the sulfathiazole gum continuously for fo months without a reaction indicating su azole sensitization or other untoward react

7. Fox, N., and others: Effect of Sulfathiazole Chewing-Gum on Certain Oral Pharyngeal Infections, Arch. Otolaryng. **41**:278 (April) 1945.

SUMMARY

asal conditions occur which, because of their linical or borderline character, go unrecogd as of allergic nature.

he associated mouth breathing of the patients, icularly during sleeping hours, results in the lopment of hyperplastic stomatitis, which is enced by coated tongue and fetor ex oris.

these patients the bacterial flora of the th changes so that an overgrowth of all coccal organisms occurs, particularly of the alpha type, or S. salivarius, which frequently comprises as high as 83 per cent of the culturable cocci.

The chewing of a gum tablet containing 0.25 Gm. of sulfathiazole for one hour four times daily will reduce the S. salivarius count from 40 to 50 per cent within four days.

Simultaneously with this reduction, the fetor disappears, although it will return on cessation of the sulfathiazole gum therapy.

841 East Sixty-Third Street.

PROGNOSIS OF THE RECURRENT NERVE PARALYSIS FOLLOWING THYROIDECTOMY

ALEXANDER F. LASZLO, M.D.
Associate Attending Otolaryngologist
AND
CHARLES O. FIERTZ, M.D.
Assistant Attending Neurologist and Physical Therapeutist
NEW YORK

One of the unpleasant complications of operation on the thyroid gland is an injury of the recurrent laryngeal nerve with its sequels in the larynx, which commonly manifests itself as a loss of voice or difficulty of breathing. The paralysis of one vocal cord may pass unnoticed by the average clinician and many times has no further bearing on the case unless the cord is paralyzed in the so-called cadaveric position, in which case the patient will have a hoarse or husky voice.

If both cords are paralyzed, though the voice may be normal, the patient's life may be endangered because of insufficient breathing space. Most surgeons are concerned over the loss of voice. This is an entirely wrong conception. If the patient is hoarse, it means there is sufficient area for breathing between the two cords, but if the voice is good and the patient makes noise while sleeping or when excited or when engaged in physical work, it suggests a limited breathing space, which if further reduced by inflammation may cause suffocation, which in turn requires constant readiness for an emergency tracheotomy.

In this article we are not concerned with these difficulties, but with the prognosis.

Will the paralysis be permanent, or does the patient have a chance for recovery? Our aim is to prove the possibility of being able to tell the surgeon and the patient what the future may bring to them.

Two years ago Dr. Fiertz and I undertook a study of a score of postoperative nerve injuries in patients who were referred to us from different thyroid clinics all over the country.

While we know that patients recover spontaneously, even in recent cases it is a relief to the surgeon and the patient to know what they may expect.

The technic is simple, and the prognosis can be made by the cooperation of the laryngologist and the neurologist, who have to work team. Thorough knowledge of the larynx, exposure and careful observation are requi for a correct diagnosis. Most of these pat are highly nervous persons, many of them averse to any examinations, and the majori them are hypersensitive about the larynx.

The patient is examined while in the si position. If the patient gags easily, the th must be thoroughly anesthetized with a 10 cent solution of cocaine hydrochloride or per cent solution of tetracaine hydrochl (better because of less toxicity and longer thetization). Highly sensitive patients may to be examined more than once before the server is able to arrive at a satisfactory i pretation. In case both cords are paralyz choking sensation with a glottic cramp is n rare occurrence. In that case repeated ex nations with a weak current (to get the pa used to it) will become necessary.

The principle of examination follows the underlying criteria as the electrodiagnosi any other peripheral nerve injury. The n sary equipment therefore consists of an elec apparatus which provides both a straight gal and a faradic current. A flat electrode, erably with a handle, the plate being abo inches (5 cm.) or so in diameter, is requ as well as a nerve-testing electrode on an i rupter handle.

In order not to alarm the patient, who not know what is coming and might easil shocked or frightened by the sudden admini tion of a current to his neck, we show him on his hand with a minimum current how current feels and what it does by applying the motor points of the musculi inter dorsales. Then, when the patient is reass the indifferent, flat electrode is placed o sternum and the nerve-testing electrode is p the motor point for the vocal cord, i. e., o respective side of the Adam's apple (promin laryngea). A moderate current is used,

From the Nose and Throat Department and Thyroid Clinic, New York Post-Graduate Medical School and Hospital of Columbia University.

tly strong to produce a contraction of the erficial musculature of the neck. Such ulation will produce some swallowing move- nts, which the patient, however, can control r a few minutes.

Then when the patient is acquainted with what being done, the laryngologist looks at the ds in the usual way. The neurologist in the antime has placed the electrodes in the appro- ate places, and when the former has a good r and the patient breathes easily, he gives signal to apply the current. Depending on damage present, one observes either no move- t in the paralyzed cord or a movement in the tenoid cartilage or in the cord itself.

f a faradic response is obtained, the damage inor and recovery can be expected in about months. If in the absence of any faradic onse the cathodal closing contraction (CCC) tter than the anodal response (ACC), the nd stage of the reaction of degeneration D) is present and recovery cannot be ex- d within less than nine months. If the ula is reversed, a complete reaction of degeneration is present and the outlook is accordingly worse. Whether or not the nerve has been anatomically severed cannot, unfortunately, be determined by one examination alone, but if after two months of biologically correct treatment reexamination gives the same or a worse formula, the conclusion is that the nerve is cut and further conservative therapy is useless. If, however, the formula or the quality of the contraction has improved, treatment can be continued, although the time for recovery will lie somewhere between one and a half and two years. If no reaction whatever is obtained, even with the strongest tolerable galvanic stimulation, the diagnosis is obvious and no benefit may be expected from electrotherapy.

COMMENT

We have used the procedure described for the last two years in hundreds of cases and we are confident that it will be a definite diagnostic aid in the hands of many competent clinicians.

124 East Eighty-Fourth Street (Dr. Laszlo).
1230 Park Avenue (Dr. Fiertz).

TREATMENT OF CHRONIC SUPPURATIVE OTITIS MEDIA WITH PENICILLIN

MAJOR JOHN J. CONLEY
MEDICAL CORPS, ARMY OF THE UNITED STATES

During the past five years a considerable amount of work and energy have been directed toward the treatment of suppurative otitis with a chemotherapeutic or a biotherapeutic agent. It has been established that acute suppurative otitis media responds well to treatment with sulfonamide compounds. The important factor in this form of therapy is to give the drug early and in sufficient quantity and to continue its use well into the safe period of resolution. There is evidence that penicillin, a more potent bacteriostatic agent, will perform in a similar manner.

It is now apparent that the sulfonamide drugs did not cure all of the draining ears, and there remains the serious problem of therapy for the condition commonly called chronic suppurative otitis media. A small percentage of the patients with long-standing purulent otitis are improved by systemic treatment with sulfonamide compounds, administered in large doses over an extended period. It also appears that local application of sulfonamide compounds in the form of powder is helpful in the management of this condition if the middle ear is readily accessible through a large perforation in the drum. This, however, solves the problem with only a small portion of the affected population, and a large group with persistently draining ears is still awaiting cure.

Penicillin aroused some enthusiasm and hope, but as yet there are insufficient data. The reports in the literature are encouraging. The investigation to be reported here permitted a rather limited optimism for the general use of penicillin and somewhat more hope for its local use in chronic infections of the ear. Although the group studied was small, the failure to respond first to a sulfonamide drug and then to penicillin systemically administered was consistent. The response to penicillin applied locally was stimulating.

Thirty patients were treated for chronic suppurating otitis media with large doses of a sulfonamide drug followed by penicillin. They were healthy young soldiers of an average age of 26 years, whose chief complaints were dra ears. Many were from overseas and had p ously had courses of treatment with penicilli sulfonamide compounds, with no marked provement. Six presented a history of tr from artillery concussion, with resultant per tion of the tympanic membrane and infec The remainder had complications of acute i tious processes. Two gave a definite histo having had fungous disease in the tropics. teen ears had discharged from one mont one year, and 14 from one year to fifteen y

An accurate bacteriologic analysis of the wound is important because of the di degrees of susceptibility to penicillin. The jority of pathogens invading the ear are s tive to penicillin, but a few are not, and should be identified. Even certain strai so-called susceptible organisms vary conside in their degree of sensitivity, and it wou interesting to know the extent of this vari in every case. The beta hemolytic typ Streptococcus and the hemolytic type of St lococcus aureus were isolated in approxim 50 per cent of the cases. The various orga observed are listed herewith:

Beta hemolytic streptococcus	8
Anaerobic beta hemolytic streptococcus	2
Hemolytic Staphylococcus aureus	5
Nonhemolytic streptococcus	2
Streptococcus viridans	2
Bacillus proteus	2
Pseudomonas aeruginosa	4
Bacillus pyocyaneus; Staphylococcus aureus	2
Pseudomonas; Staphylococcus albus	2
Bacillus proteus; Staphylococcus aureus	1

Routine smears for fungi showed none. T culous infection of the middle ear was encountered. Bacillus proteus and Pseudon aeruginosa were present in many cultures b most instances were not considered patho after further subculturing. However, they troublesome, frequently overgrowing the p genic organism on the culture plate. In instances culturing had to be repeated thr five times before the true pathogen was covered. The discharge of the ears that sented these contaminants was characteris milky and bubbly. On culture, none o organisms produced gas, and it is assumed the air came from the eustachian tube and

Read before the combined meeting of the Philadelphia Laryngological Society and the College of Physicians in Philadelphia, Jan. 17, 1945.

ociated with sneezing, swallowing, and blowing the nose.

Twenty-three of the perforations were readily ssible and of a diameter to be engageable. e middle ears contained infected granulomas. e degree of intensity of the infection was in eral marked. Routine roentgen examination he mastoid processes showed 10 pneumatic, sclerotic and 5 diplosclerotic types. Two tgenograms revealed suppuration of the mas- process; 1, cholesteatoma; 4, periantral ding.

The plan was to give these patients first a se of treatment with sulfadiazine, then to ow with penicillin for the ones that failed to rove. All but 2 patients received sulfadiazine . One of these was known to be sensitive he drug. The other manifested irritative rinthitis with nausea and vomiting. Another red blood cells and sulfonamide crystals in urine after two days of the chemotherapy, it was necessary to discontinue this therapy institute treatment with penicillin. The rage dosage of the sulfonamide drug was grains (5.8 Gm.) a day for a period of ten s. No local application was employed in the dle ear. However, the ears were cleansed oughly at least once a day by suction, and is and granulation tissue were appropriately oved. If a patient showed signs of improv- the use of the drug was continued. When rovement was not manifest, penicillin re- ed the sulfonamide compound. The shortest od of treatment was five days; the longest days. Ears which healed completely as a lt of the treatment with sulfonamide com- nd are not discussed in this paper. They uded principally those in which acute sup- ative otitis was present, with a very small rentage in which the infection was chronic. roximately 25 per cent of the total group er discussion demonstrated an inclination to rove on treatment with sulfadiazine but com- e resolution was extremely difficult to attain. haps if the use of the drug had been con- ed for several more weeks, complete resolu- would have occurred, but this is open to stion.

here were no serious complications of the notherapy. It should be emphasized that the t value of treatment with sulfonamide com- nds is not in chronic but in acute infections e ear, and even more in prophylaxis against development of suppurative processes in the dle ear and the mastoid process. It is well to the patient about his previous experiences this type of therapy, now that it is being so freely. One person gave a history of a sulfonamide compound having been previously administered, with sensitivity to the drug resulting in a cutaneous rash.

Twenty-eight patients received 1,000,000 units of penicillin, 25,000 units intramuscularly every third hour for five days. The patient with otitis media and irritative labyrinthitis was given 2,000,000 units, and another with sinus phlebitis and petrositis, 3,300,000 units in conjunction with sulfadiazine. The latter patient is unusual in that in him septicemia developed, with the blood culture yielding a growth of an anaerobic beta hemolytic streptococcus after ten days of treatment with sulfadiazine while he was being actively treated with penicillin. He had received approximately 300,000 units of penicillin when the sepsis appeared. A thorough modified radical mastoidectomy, supplemented with sulfadiazine and penicillin therapy, did not cure the disease, and fourteen days later obliteration of the sigmoid sinus and of the common facial and internal jugular veins had to be carried out. There was profuse foul purulent drainage from the middle ear. Pain deep in the temporal bone and retro-orbital headache persisted for three weeks after the second operation, and serial roentgenograms revealed destruction of the trabeculae of the pyramid. The cortex was intact, and the spinal fluid remained normal. The presence of a fistula could not be substantiated, as only a modified radical operation had been done, and no posterior tract was found. At the time of writing, the patient has been free of symptoms for two months; and the middle ear is dry.

Penicillin can apparently be administered with little fear of serious complications. As yet my associates and I have not observed an untoward effect whether penicillin was given in small or in massive amounts. In 3 patients external otitis developed while they were being given penicillin, probably as a result of trauma in cleansing the ear.

Four of this group were operated on. In addition to the aforementioned patient with phlebitis and petrositis, 1 underwent an endaural radical mastoidectomy for cholesteatoma, and 2 underwent simple mastoidectomy for suppurative mastoiditis.

The clinical response of chronic suppurative otitis media to a course of treatment with sulfadiazine and penicillin was significantly slight. The 30 patients with chronic infections were arbitrarily divided into two groups: 14 whose involved ears had drained for one month to one year and 16 whose ears had drained from one year to fifteen years. In the first group 9 showed no improvement, 4 questionable slight improvement and only 1 revealed definite resolution. In

the second group, which contained the ones with the more chronic infections, 11 did not improve, 4 showed questionable improvement, and only 1 showed resolution. This breakdown fails to indicate any difference in response between the ear in which the infection has recently become chronic and the ear with a long-standing involvement. Of the 30 ears with chronic infection, 20 failed to improve in any way whatsoever, 8 showed questionable slight improvement, and only 2 resolution. The pathogens of 6 of the 20 ears that did not respond are known to be insensitive to this form of therapy, and those 6 ears should not count. It is worthy of statement that many of the 30 patients had been treated in other army hospitals without success and that they might be considered an unusually resistant group. However, the impression is definite that once an infection of the ear enters the chronic phase, whether the ear has been treated previously with a biologic or a chemical substance or not, the probability of successful management by systemic administration of a sulfonamide compound or of penicillin is slight.

A curious phenomenon in this group was the spontaneous resolution of chronic infection in 4 patients from one to four weeks after the active treatment had been stopped. Eleven patients gave a history of exacerbations of their chronic conditions, and 1 had seven exacerbations in one year. It was assumed that these remissions were spontaneous and not associated with the intensive courses of treatment which the patients had received.

None of the 5 patients with granulation tissue in the middle ear were favorably affected. The character of the granulation tissue did not change under therapy, and it was necessary to remove it surgically.

In view of this meager success from the use of sulfadiazine and penicillin generally in patients with chronic suppurative otitis media, a plan of local therapy was adopted for penicillin solution. The technic outlined by Swanson and Baker [1] was carried out in substance. Twice a day the external canals were thoroughly cleansed with sterile applicators and, with the patient lying on his side, 1.5 cc. of a solution of penicillin containing 2,500 units per cubic centimeter was instilled in the canal and then displaced into the middle ear with the aid of a pneumatic otoscope. The solution was trapped in the middle ear by placing a petrolatum plug in the external canal.

Thirty chronically involved ears were treated in this manner for a period of ten days. Twelve of the patients of this group had been previously treated with a sulfonamide compound and penicillin systemically, without improvement. In patients infection followed the trauma of artiller concussion, and in 26 there were complications o acute infectious processes. As in the previou group, tuberculosis and fungous disease wer eliminated. Nine ears had discharged for or month to one year, and 21 from one year t twenty-five years. Roentgen study of the mas toid processes showed 18 to be sclerotic, 6 pneu matic and 6 diplosclerotic types. All of th patients had engageable perforations.

The results of bacterial study varied somewha Only 36 per cent of the ears revealed infectio with a hemolytic streptococcus or staphylococcu The ubiquitous B. proteus and P. aeruginos persistently complicated the analysis. The organ isms observed may be listed as follows:

Beta hemolytic streptococcus	6
Anaerobic beta hemolytic streptococcus	1
Hemolytic Staphylococcus aureus	4
Nonhemolytic streptococcus	3
Nonhemolytic Staphylococcus aureus	1
Bacillus proteus	2
Pseudomonas aeruginosa	7
Staphylococcus albus	2
Bacillus coli	1
Pseudomonas aeruginosa; Staphylococcus aureus	2
Bacillus proteus; nonhemolytic streptococcus	1

There were no serious complications of th technic, but the possibility of disturbing a fistu or breaking through a thinned area of defen exists. Several patients exhibited vertigo an nausea during and after the procedure of di placement. In 4 patients external otitis deve oped as a result of traumatization of the can wall. Two had overflow of the penicillin in the nasopharynx through the eustachian tub Little pressure is required to displace the solutio into the middle ear. An airtight system is n essential and may be dangerous. Enough pos tive and negative pressure to move a few dro of penicillin solution is all that is necessary.

The results were encouraging. Every e appeared healthier and cleaner during the pha of treatment. Again there was no significa difference between the response of the ear wi the so-called recently chronic infection and th ear with an infection of long standing. In 5 ea the disease completely resolved; 3 of these heal with elimination of the perforation of the tym panic membrane. Eleven ears showed modera clinical improvement as recognized by mark diminution in the amount of discharge, with thi ning of its consistency. In some of this group th condition had apparently resolved and then fo lowed a slightly retrograde course. Othe reached a certain amount of improvement an held it. Ten ears were significantly helpe some even to apparent resolution, and then r

1. Swanson, C. A., and Baker, D. C., Jr.: The Use of Penicillin in Diseases of the Ear, J. A. M. A. **126**: 616 (Nov. 4) 1944.

gressed within one or two weeks to their original status. This was the most disappointing phase of the investigation. Four were ultimately not affected by this form of therapy. In these the infecting organisms were not the susceptible type. Six ears presented varying amounts of granulation tissue, and although these ears improved with respect to discharge, there was not the slightest change in the granulation tissue, and eventually it had to be removed surgically. This phenomenon was encountered also during the systemic treatment for chronic otitis media, that it appears necessary to remove all aberrant tissue and debris from the middle ear before one can hope that any local or general therapy will be beneficial. Nor is cholesteatoma cured by this technic. This obviously places a handicap on any type of treatment for antritis which does not take account of diseased bone or granulation tissue in the region of the antrum.

In a minute way the 3 ears of this group that underwent surgical treatment bear this out. All were infected with susceptible organisms, and although they responded well to local penicillin therapy, they regressed to their original condition. They had adequate perforation for treatment. The appearance of the middle ears was not impressive, and the roentgenograms revealed sclerotic mastoid processes. Operation established the fact that there was infected, tough, organized granulation tissue in the region of the antrum, in the antrum itself and in the epitympanum. This is one type of ear in which no cure will be obtained with any of the known biologic or chemical therapeutic agents. Another type is the one infected by an organism that is not susceptible to the agent.

In spite of intensive systemic treatment with sulfadiazine and penicillin, local therapy in the form of cleansing, removal of granulations and debris and topical application of a solution of penicillin, about 50 per cent of the chronically discharging ears continued to drain. These resistant ears either must have been invaded by an organism that is insensitive to biologic and chemical therapeutic agents or must have an active suppurating epitympanitis and antritis with necrosis of bone and inaccessible granulation tissue, or both. It is difficult to be dogmatic about the diagnosis of antritis inasmuch as it requires an operation to substantiate it. However, with a chronically involved, ear, an essentially negative roentgen report or a report of antral clouding, a susceptible organism that fails to respond to general and local treatment with a sulfonamide compound and penicillin, and a persistent discharge, one can be suspicious. The patients present few complaints—aural discharge, hearing usually diminished to varying degrees, tinnitus in some instances and an occasional sharp pain in the ear. Ordinarily these would be insufficient to warrant surgical intervention, but if the patient is suffering from suppurative antritis, mastoidectomy may be the treatment of choice. The acuity of hearing, the type of operation desired, the condition of the drum membrane and the tympanic cavity, the type of mastoid process and other factors frequently alter the choice of therapy. Each case becomes a unique and special problem, and it would be unwise to contemplate surgical intervention for the vast majority of these persons. On the other hand, a new and more vigorous type of emphasis needs to be given suppurative antritis.

COMMENT AND CONCLUSIONS

Penicillin therapy is of little help in patients whose chronic suppurative otitis media has proved resistant to sulfonamide compounds.

The response of chronic suppurative otitis media to systemic treatment with sulfadiazine followed by 1,000,000 units of penicillin was insignificant.

The response of chronic suppurative otitis media to local penicillin therapy was good; 53 per cent of the ears were definitely improved.

Granulation tissue and cholesteatoma are not affected by sulfadiazine or penicillin whether administered generally or locally.

A new emphasis should be placed on antritis and epitympanitis and an attempt at diagnosis of these conditions made.

The best treatment for acute and chronic suppurative otitis media is to prevent their occurrence by the prophylactic use of one or both of the chemical and biologic therapeutic agents.

313 Roland Avenue, Carnegie, Pa.

STRIPPING OF THE VOCAL CORDS

JOHN M. LORÉ, M.D.
NEW YORK

The common observation that after laryngofissure tissue replacement produced a structure which objectively looked not unlike a true vocal cord led me in 1932 to studies of cat larynxes.[1] I felt that if this regeneration or reformation took place following such an extensive procedure as laryngofissure, it was reasonable to expect complete replacement after a much less formidable operation. With this in mind, a series of experiments were performed on cats:

On the basis of these experiments it seemed permissible to state that after removal of a vocal cord structural regeneration would produce a new cord. Grossly, it was impossible to distinguish between the normal and the regenerated cord. Functionally, the results were satisfactory, provided that the basic principle of insuring that a straight free edge would be left after operati was adhered to. The importance of this has be proved by the practical results obtained in t human larynx. Stated differently, if an irregu piece of the cord was removed, leaving an irreg lar edge, the end result, after healing, was irregular or bowed cord, with resultant po function.

TABLE 1.—*First Series of Experiments*

Cat	Operation	Postoperative Observations	Postmortem Observations
1	6/16/32. Removed anterior ⅔ of right vocal cord	6/17/32. Aphonia almost complete 6/29/32. Right cord shows regeneration; voice coming back 9/21/32. Voice somewhat hoarse; right cord is pearly white but edge is somewhat irregular	9/8/32. Right cord not perfectly straight, owing to fact that only anterior ⅔ of s was removed instead of entire cord
2	6/29/32. Removed left cord by stripping—sent specimen to laboratory for microscopic study	9/21/32. Voice slightly hoarse; left cord looks like right except that it is slightly thinner	9/28/32. New left cord could not be di guished from right normal one; microscopically it was like original cord in st ture except that it was thinner
28	3/13/33. Removed left cord	3/22/33. Voice improving; left cord being replaced by new tissue; very little deformity; no impairment of movements	5/30/33. Larynx removed; cord seems to regenerated—can barely distinguish bet new and normal cord; before death, vo was returning
17	2/16/34. Removed left cord, including some muscle tissue	.....	3/8/34. Healing not complete—some bowi epithelization started

TABLE 2.—*Second Series of Experiments*

Cat	Operation	Postoperative Observations	Postmortem Observations
40	11/23/33. Punched out two pieces from left cord, including muscle	2/16/34. Slight bowing at anterior ⅔ of left cord; right cord comes over to meet left and fill concavity; voice good	3/8/34. Bowing gone—cord very prominent
41	11/23/33. Punched out cup-shaped piece from left cord (muscle included)	2/16/34. Left cord thinner than right one; free edge is straight from anterior commissure to vocal process (outer aspect); tab of granulation tissue on vocal process; voice good	3/8/34. Same as on 2/16/34. Tab of tissue on vocal process still present
34	2/16/34. Removed wedge-shaped piece from anterior ⅔ of left cord, using wedge-shaped punch forceps	.....	3/18/34. Defect partially filled in epithelization not complete—ap ently growing in from ends

Since this experimental work was comple over 100 patients have been operated on. Oth have tried this operation,[2] with satisfactory sults. Certainly the old conception that a v cord should not be stripped has been disprov both the clinical and the functional results w rant this statement.

Presented at the meeting of the New York Academy of Medicine, before the Section on Otolaryngology, Dec. 20, 1944.

1. Loré, J. M.: Stripping of the Vocal Cords, Laryngoscope **44**:803-816 (Oct.) 1934.

2. Putney, F. J., and Clerf, L. H.: Treatmen Chronic Hypertrophic Laryngitis, Arch. Otolaryng. 925-929 (June) 1940. Imperatori, C. J.: Personal c munication to the author. Jones, D. H.: Pers communication to the author. Orton, H.: Personal c munication to the author. Kernan, J. D.: Pers communication to the author. Myerson, M. C.: sonal communication to the author.

INDICATIONS

Benign Growths.—Generally speaking, any benign growth lends itself to this operation. The degree of stripping will depend on the extent of the lesion or lesions. The benign growths in the present series have been single or multiple polypi, as well as extensive polypoid degenerative changes of both cords, simple papillomas (single or multiple), blood tumors and nodes.

Malignant Growths.—In the class of malignant growths I include hyperkeratotic papillomas. Most observers believe that these growths are precancerous, but a safer and saner view is to consider them as cancerous since, if not eradicated, they develop into extensive carcinoma and cause death.

It is with considerable reluctance and misgiving that carcinoma of a vocal cord is mentioned in connection with the stripping operation, and must be distinctly understood that I do not advocate this procedure as the method of choice, at least not yet. However, some recent experiences prompt me to touch on it. This operation has been done on 4 patients with carcinoma of the vocal cord: 2 of mine and 1 of Dr. David H. Jones and 1 of Dr. Joseph Rongetti. In all of these instances it was done because laryngofissure had been refused and roentgen treatment accepted.

I believe every laryngologist has had the experience of performing a biopsy on a larynx presenting a small superficial lesion of one cord and getting back the pathologist's report of carcinoma. Then, following laryngofissure, in some of the cases, careful examination of the tissue removed did not show any cancer. Of course, the logical conclusion in these cases has been that the offending growth was removed at the time of the biopsy. If this happens with a simple biopsy, why could it not happen more frequently with a more extensive procedure, such as stripping?

Given a case, therefore, of an early lesion, with no apparent infiltration or impairment of motility and with no involvement of the anterior commissure — a case ideal for laryngofissure if the lesion is malignant—and the patient refusing operation, why not perform the stripping operation and immediately follow this with roentgen therapy? In these cases the stripping operation replaces the biopsy procedure and serves two purposes: If the lesion turns out to be benign, the operation performed is definitely indicated and will probably cure the condition. Should it turn out to be malignant, the stripping will have removed most, if not all, of the growth and will have given roentgen therapy a better start.

TABLE 3.—*Third Series of Experiments*

Cat	Operation	Postoperative Observations	Postmortem Observations
Black and white, small	3/6/33. Stab wound external to left cord, through floor of ventricle—cord was too small to permit removal of tissue external to cord	3/13/33. Left cord swollen, moves freely—no bowing. Removed anterior ⅓ of left cord with cup-shaped forceps 3/22/33. Smooth granuloma on posterior ⅔ of left cord; movements not impaired 3/27/33. Granuloma smaller and paler—left new cord can be seen 11/2/33. Granuloma gone; left cord slightly paler than right; movements normal	
25	3/13/33. Removed tissue external to left cord and through floor of ventricle 3/27/33. Removed more tissue from floor of left ventricle	3/27/33. Good movements and approximation; voice good. See note under operation	6/11/33. Cat died from other cause. Larynx showed scar tissue in floor of left ventricle. Left cord seems slightly bowed. Voice was good
29	11/2/33. Punched mucous membrane from surface of left cord and floor of left ventricle	2/16/34. No signs of bowing; scar-tissue demonstrable	3/8/34. No bowing; small area of scar tissue external to and above cord

In each of these 4 patients the lesion was confined to one cord, caused no fixation and did not involve the anterior commissure. For only 2 of the patients was a tentative preoperative diagnosis of carcinoma made. After complete stripping (down to muscle, viz., the thyroarytenoideus) and a positive report of carcinoma, roentgen therapy was immediately instituted, with gratifying results. All 4 patients now have normal-looking larynxes. However, no claim for cure is made because of the time element. It must be again emphasized that this was done only because laryngofissure was refused in the event that the lesion turned out to be malignant.

I have observed 8 patients (including 1 of Dr. David H. Jones) with hyperkeratotic papilloma, and all those who were treated by the stripping operation are well and free of any signs of disease. Only 1 refused operation, and he died

of extensive carcinoma. More will be stated later about the technic followed in these cases.

BOWED CORDS

This classification refers to those cases in which there is bowing of the cords from the tips of the vocal processes to the anterior commissure and in which the vocal processes are prominent and point more medially than anteriorly, thus leaving another gap between those tips and the posterior commissure. In these cases, and I have encountered only 2, the prominent part of the vocal processes (tips) together with part of the attached cords have been removed. This has served to straighten the cords and permit approximation.

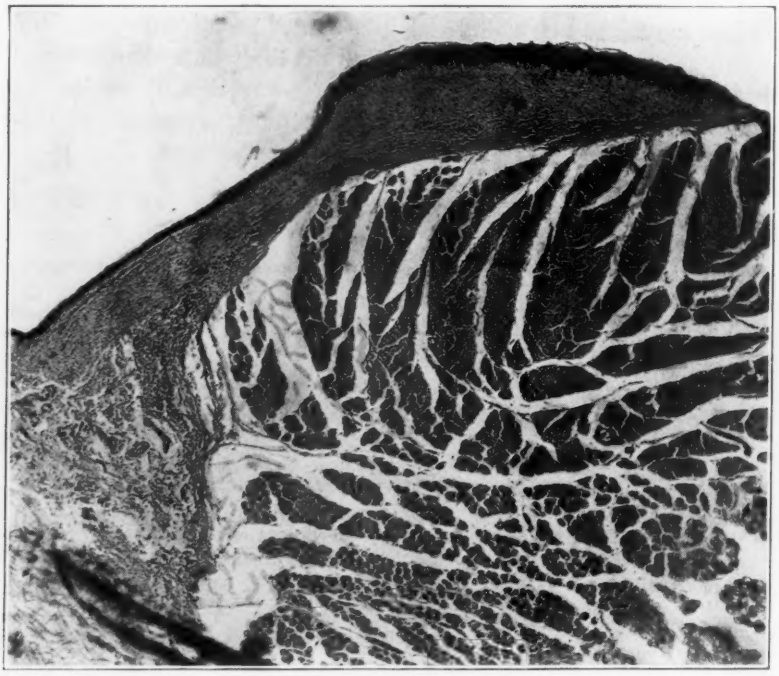


Fig. 1.—Normal cord of cat.

TECHNIC

The usual preoperative conditions, viz., freedom from active laryngitis, acute sinusitis or acute diseases of the throat, are essential.

ANESTHESIA

I admit that in many of these cases the stripping can be done with the patient under local anesthesia, and occasionally I do it using only local anesthesia because of special considerations, but as a rule I feel that general anesthesia is the anesthesia of choice. The period of anesthesia is so short that by the time the patient is returned to his or her room consciousness has practically returned.

Under the technic of inducing anesthesia pra ticed at St. Vincent's Hospital, complete relax tion of the larynx and abolition of laryng reflexes are obtained. Exposure of the voc cords and surgical manipulation become co paratively simple procedures and the actu stripping a deliberate and unhastened operatio This lends itself to careful and exact operati and permits thorough inspection of the operati area after removal of the diseased tissue. In dentally, there is less trauma to the other tissu involved in the exposure and operation becau less force is required. At no time have I obser any untoward event as a result of employing form of anesthesia.

The only preoperative medication given hypodermic injection of a solution of atro sulfate, 1/150 grain (0.43 mg.) in adults 1/200 grain (0.3 mg.) in children. This i reduce secretions. I have not found it neces to give any barbiturates or morphine. In fa believe that morphine is contraindicated as is anxious to have the protective cough re return as soon as possible. The atrophine su is given thirty minutes before the operation. anesthetic sequence has been as follows: Nitr oxide and ether are administered, producing narcosis so that the mouth can be opened e and the laryngoscope introduced. As soon as larynx has been exposed, it is swabbed wi cotton applicator containing a 10 per cent s tion of cocaine hydrochloride. This is ap

the false and the true cords first and then assed between the cords and applied subglotically for a distance of about ½ inch (1.25 cm.). his is done once or twice, and rarely is it necesry to repeat it. The larynx is now at complete st, there being no laryngeal reflexes present. o further ether is administered after the intial rcosis except in those unusual cases requiring more protracted surgical procedure. No postperative narcotic medication is given.

INSTRUMENTS

The anterior commissure speculum of Jackson the instrument of choice and is ideal for this rk. At one time I tried the laryngostat, but it not quite measure up to the requirements of easy and adequate exposure. Of the laryngeal ceps, the Imperatori subglottic forceps is ideal. ve modified it by making it 3 mm. longer and ing the anterior two thirds very sharp and posterior third somewhat duller. This makes ossible to start the stripping anteriorly. There right and a left forceps. The small original s of Imperatori are better suited for children younger adults. To prevent confusion, these ruments should be known as the Imperatori glottic forceps (small and large). Occasionaluse either the straight or the curved cup ceps. Wedge-shaped forceps are mentioned ly to condemn their use in this operative proure.

THE OPERATION

In exposing a cord, the contralateral approach is used. For example, if the right cord is being operated on, the anterior commissure speculum is introduced from the left side of the mouth. The beak of the instrument is introduced almost as far as the anterior commissure and then rotated so as to direct the light right on the diseased cord. Occasionally, it may be necessary that the beak be inserted between the two cords and then rotated. In all cases of complete stripping, the anterior commissure must be exposed. If for anatomic reasons the usual approach or lifting of the larynx produces an inadequate exposure of the cords, one of two things may be done: The speculum may be used as a suspension instrument or pressure may be exerted from without on the laryngeal box, thus bringing the anterior commissure into view. With this exposure, the cord to be operated on is fixed and fully exposed. The floor of the ventricle can also be seen, and if any pathologic process exists subglottically, this can be visualized.

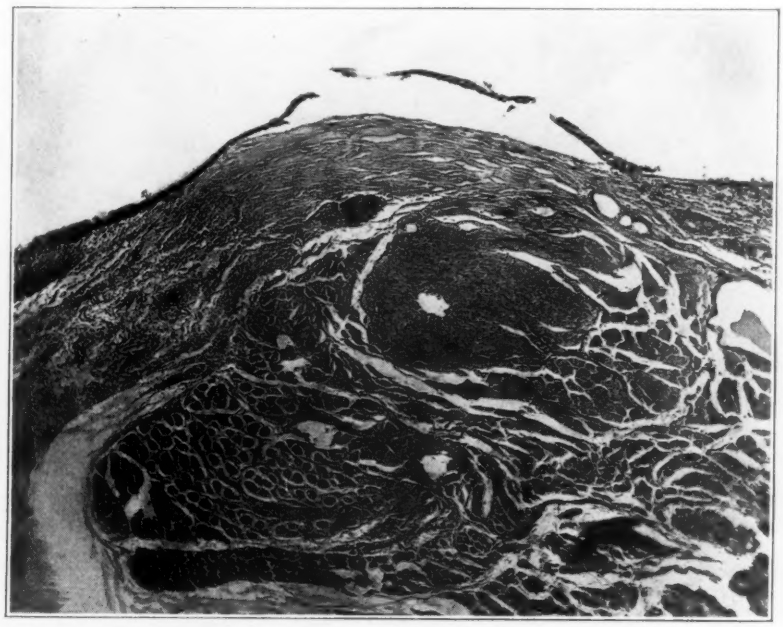


Fig. 2.—New vocal cord in cat (low power).

While the principle of stripping is the same with single discrete growths and with extensive polypoid degenerative changes, the technic varies somewhat.

Originally, I removed single growths by punching them off, but I found that by stripping them off I could obtain more satisfactory results. Given a patient with a growth, say on the middle

third of the right cord, the operative procedure, after proper exposure and fixation of the cord, is as follows: The right-sided Imperatori subglottic forceps (closed) is introduced through the laryngoscope and the growth contacted. The blades are then opened, and the growth and subjacent cord are engaged gently. Slight traction is then made toward the free edge until the growth itself is felt in the forceps. Then the forceps is closed tighter. At this stage it is important to visualize the cord to make sure too much is not being removed. If too much tissue is engaged, the forceps is opened a little until the proper amount of tissue is included in it. Then the growth is stripped from the cord. Gross examination of the growth will show it to have two thin small strips of cord tissue attached to it. The denuded area on the cord is very small, the edge is straight with no notching and bleeding is negligible. This sounds complicated but really is simple after a little practice. And the end results warrant the extra care.

If the growth is more extensive, the diseased tissue is removed from or with the cord, depending on the amount of pathologic change. The cord is first contacted with the forceps closed. Then the forceps is opened, and as much of the cord as necessary is engaged. The instrument is then closed tightly and the engaged tissue stripped from or with the cord. The removal of the tissue may extend as deep as the fibers of the thyr arytenoideus muscle or to the floor of the ventric or subglottically. In all of these procedures stripping, it is essential that the long axis of t forceps be kept parallel to the free edge of t cord. The only exception I make to this is regard to discrete subglottic growths; with the I rotate the subglottic forceps so that the anteri end points away (externally) from the free edg The curved cup forceps can also be used wi such growths.

When there is too much diseased tissue to removed in one stripping, the procedure is r peated until it has all been removed (during t same anesthesia). It must be borne in mind t the long axis of the forceps must be kept para to the cord. The tip of the vocal process is be avoided.

In order to avoid synechias in cases of bilat involvement, only one cord is operated on a time, except in those cases in which the les do not involve the anterior third of either c In cases of hyperkeratotic papilloma all area diseased tissue must be removed. Most of my tients with hyperkeratotic papilloma have bilateral involvement, and in some the dis has extended to the ventricular bands. Usu more than one operation will be necessary these lesions, but keeping after them and rem ing all signs of the disease will result in a cur

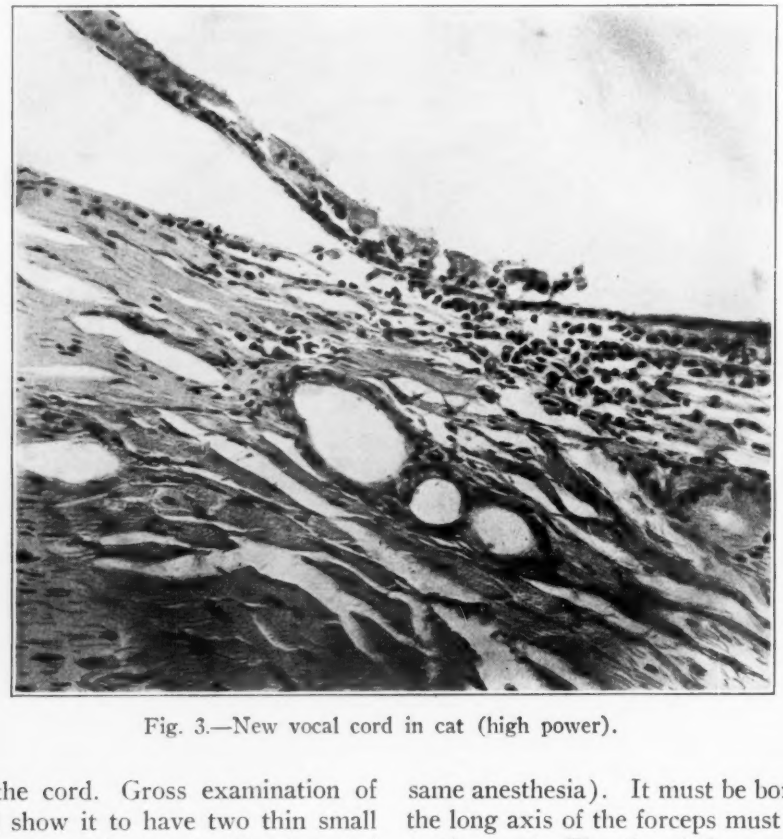


Fig. 3.—New vocal cord in cat (high power).

PATHOLOGY

The following is a report by Dr. Antonio Rotino, pathologist at St. Vincent's Hospital, covering only the most recent cases:

From January 7 to November, 15 laryngeal biopsy specimens were received from Dr. Loré. This represents material collected in his own practice. A study of these disclosed 1 case of leukoplakia laryngis, 1 case of papilloma, 1 case of hemangioma, 1 case of combined polyp and polypoid, 3 cases of carcinoma, 3 cases of polypi and 5 cases of a polypoid state.

Leukoplakia laryngis consists of hyperkeratosis and parakeratosis and is a condition in which the mucosa is clearly white and thickened, owing to increase in keratin and increase in number of friable cells. The condition is considered precancerous.

Papilloma is rare. Grossly the lesion simulates the appearance of a small cauliflower. Microscopically it is produced by the formation of numerous closely adjacent finger-like projections of the mucosa, of supporting fibrous stroma lined by stratified squamous epithelium.

Hemangioma is also uncommon. The lesion observed in us consisted of innumerable closely adjacent small dilated arterioles.

Carcinoma constitutes 3 of the specimens. In each it was stratified squamous cell in type.

About one third of the specimens represented a condition labeled by the laryngoscopist as a polypoid state. The condition is one in which the laryngeal cords are swollen, boggy, edematous. The counterpart of this is seen microscopically in edema. In a few cases chronic inflammation is observed, characterized by the presence of lymphocytes and large round cells.

Simple polyp of the larynx is relatively common. It may exist alone as a single or a multiple lesion or may be associated with the polypoid state. A typical simple polyp is a small pedunculated protrusion or growth from the mucosa. Histologically it is characterized by the presence of a small amount of supporting stroma lined by a thin layer of stratified squamous epithelium. In the stroma one usually finds a sinus-like vessel lined by simple endothelium. Degenerative change is common in polypi. This takes the form of edema and myxomatous change. At times the sinusoidal blood vessel becomes markedly dilated to the form of a blood cyst, or it may rupture and bleed into the edematous stroma. Often the vessel leaks plasma into the interstitium. This appears as a deeply staining fibrinoid material.

POSTOPERATIVE MANAGEMENT

Contrary to the usual practice, I permit the patients to talk immediately after operation. In fact, I encourage it. Whispering, in the usual conception, is condemned, as it puts a greater "load" on the vocal cords and encourages the patients to use a set of muscles the use of which is prejudicial to early subsequent normal use of the voice. Many of these patients present themselves with faulty use of the larynx, and it is of the utmost importance to correct this at once. Singing, however, is not permitted for four to six weeks or until the denuded area is entirely epithelized.

Locally one may occasionally use an oily spray containing paramonochlorophenol or a 5 per cent aqueous solution of sodium sulfathiazole.

Postoperatively there occasionally is an overgrowth of granulation tissue, which must not be mistaken for diseased tissue. In due time this exuberant tissue disappears as the stratified epithelium grows in from the edges and covers the denuded area. At first the new cord, after complete epithelization, is pink but soon assumes a gray and finally a whitish appearance, not unlike a normal cord.

END RESULTS

Clinically, the end results have been uniformly satisfactory. Functionally, all patients have been improved, many of them getting a normal or near normal voice. I am planning to make detailed careful studies of these larynxes (before and after surgical treatment) by means of the high speed camera (up to 4,000 exposures per second) which is about to be put into use at St. Vincent's Hospital. I am also interested in the role of the aryvocalis muscle and hope to have some pertinent data on the physiology and pathologic physiology of the vocal cords.

The only type of case in which one occasionally observes a mild recurrence is that of the generalized polypoid degeneration of the cord. Proper use of the voice may prevent some of these recurrences.

SUMMARY

Experimental stripping of the vocal cords in cats established the fact of vocal cord regeneration. Application of this operation to the human larynx confirmed the experimental findings.

All types of benign lesions lend themselves to the stripping operation. Hyperkeratotic papilloma can be cured by this operation.

General anesthesia supplemented by local anesthesia induced by the application of a solution of such anesthetic drugs as cocaine hydrochloride or tetracaine hydrochloride is the anesthesia of choice.

The operative technic described has proved satisfactory.

The postoperative management with silence or whispered voice is questioned. Better end results have been obtained by permitting reasonable use of the voice.

Functional results have been uniformly good.

The satisfactory results obtained warrant the continued application of the principles of this operation.

THE NEGLECTED SEPTAL CARTILAGE GRAFT

(WITH EXPERIMENTAL OBSERVATIONS ON THE GROWTH OF HUMAN CARTILAGE GRAFTS)

LYNDON A. PEER, M.D.
NEWARK, N. J.

Many otolaryngologists and plastic surgeons appear to avoid the use of septal cartilage as a grafting material because of the mistaken impression that it is absorbed after transplantation. This erroneous belief induces the surgeon who is repairing a nose with an old depressed fracture to perform a submucous resection for the purpose of restoring breathing space but to discard the septal cartilage and bone which might be used as grafting material to fill the saddle depression. The patient is then subjected to additional surgical operation for removal of his rib cartilage, or else inferior material, such as preserved cadaveric cartilage, is used to restore the nasal bridge.

In many of these cases the septal cartilage removed during the submucous resection would have provided sufficient grafting material for repair of the saddle.

The general depreciation of septal cartilage as material for grafting is apparently based on derogatory statements which have been copied from textbook to textbook without critical investigation and on reports of single cases in which septal cartilage transplanted in the nasal tissues became infected and was liquefied or extruded.

I have often inquired of otolaryngologists why they do not make use of septal cartilage for grafts, and the usual answer has been that septal cartilage is elastic cartilage and for this reason is absorbed after transplantation, whereas rib cartilage is hyaline cartilage and therefore is more resistant to absorption. This is indeed strange reasoning, since septal cartilage is not yellow elastic cartilage; septal cartilage is *hyaline cartilage* and very similar to hyaline rib cartilage. The structure of septal and rib cartilage is so similar that one may consider septal cartilage as a thin form of rib cartilage.

Actually, true yellow elastic cartilage, such as the cartilage of the ear, is not absorbed after transplantation. It remains unaltered in structure as do septal cartilage, alar and lateral cartilage and rib cartilage, provided they are autogenous grafts (fig. 1 *A* and *C* and fig. 2 *A*). Septal cartilage is superior to aural cartilage and alar cartilage as a grafting material only because of its larger bulk and firmer structure. Septal cartilage is preferable to rib cartilage because it is more easily removed from the patient.

The clinical evidence for the survival of septal cartilage grafts after transplantation rests on the experiences of a number of otolaryngologists and plastic surgeons, who have used the graft but do not emphasize its value in their communications and on my own clinical experience with septal cartilage grafts transplanted in 800 patients. Examination of my own patients as long as nine years after operation has demonstrated the presence of the septal cartilage graft along the nasal dorsum or between the mucous membrane flaps of the septum.

The experimental evidence for the survival of septal cartilage grafts rests on the microscopic examination of human septal cartilage grafts reported by me in the ARCHIVES [1] in 1941. The results of this experimental work clearly indicated that autogenous septal cartilage grafts without perichondrium survive as living cartilage following transplantation. The contrary belief that septal cartilage is absorbed after transplantation has been predicated on inaccurate and faulty observation. The acceptance of this older point of view by otolaryngologists has greatly retarded the development of procedures to correct congenital and acquired nasal deformities.

PHYSIOLOGIC AND CLINICAL CONSIDERATIONS OF THE GRAFTING OF CARTILAGE

In transplanting living autogenous cartilage grafts an important consideration is the survival of the living element of cartilage, the cartilage cell. The matrix is inanimate material, produced by the activity of the cartilage cells. If the cellular elements fail to survive transplantation the matrix will degenerate, but if the cellu-

1. Peer, L. A.: The Fate of Autogenous Septal Cartilage After Transplantation in Human Tissue, Arch. Otolaryng. **34**:696 (Oct.) 1941.

lements survive, the matrix will remain. Obvisly, cartilage cells, like cells of the skin, may il to survive when the graft is transplanted in debilitated patient with low plasma protein or ith secondary anemia. The cartilage cells may so die when the graft is transplanted in tissues ith poor circulation, even though the general ndition of the patient is satisfactory. Such afts, with dead cartilage cells, may remain in ace, but over long periods the cartilage matrix will be invaded and replaced by fibrous tissue. This probably accounts for the occasional gradual disappearance of a few autogenous cartilage grafts.

The belief that thick autogenous grafts survive better than thin ones is erroneous. The central portion of a thin cartilage graft survives better after transplantation than the central portion of a thick cartilage graft inasmuch as the latter is further removed from its source of nourishment.

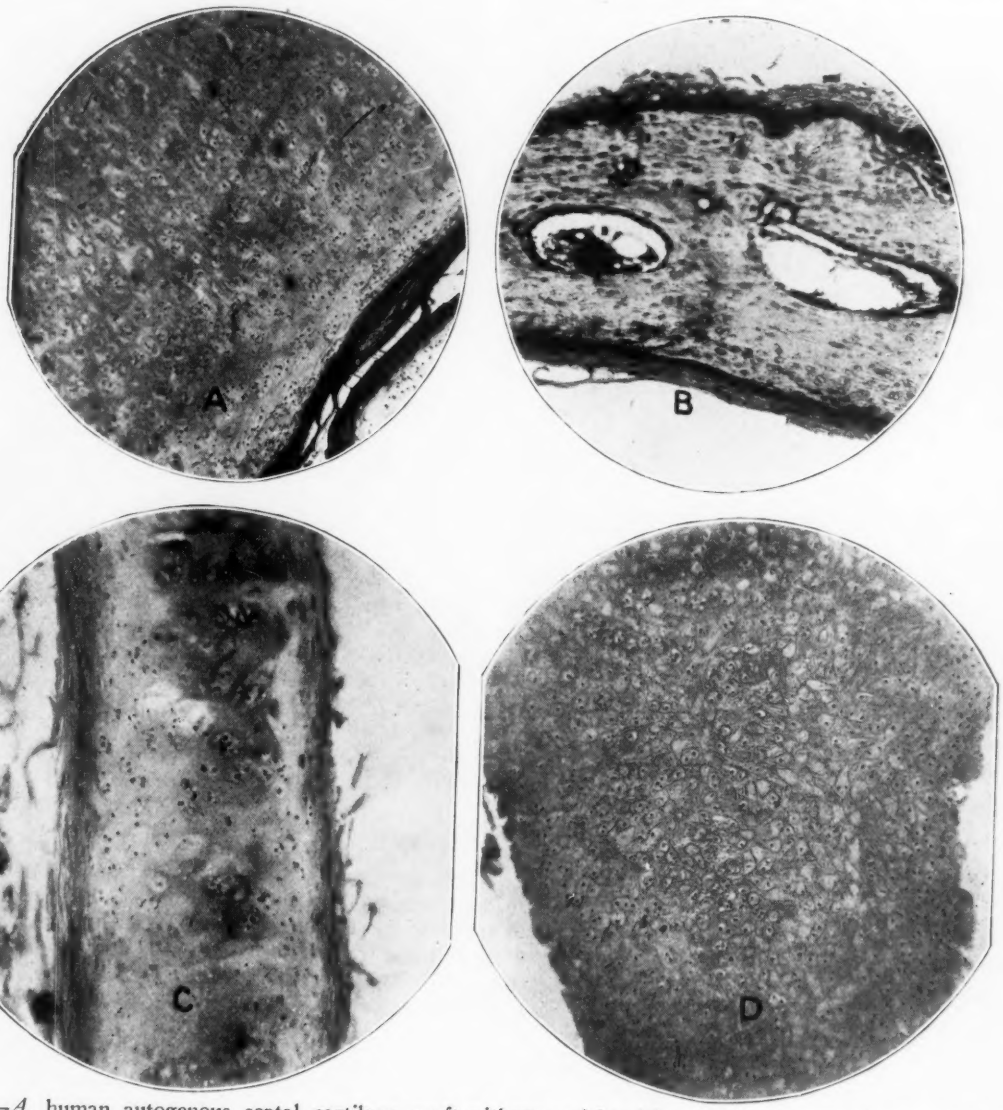


Fig. 1.—*A*, human autogenous septal cartilage graft without perichondrium buried between the mucous membrane flaps of the nasal septum for four years and six months. There is complete absence of invasion, and the cartilage cells appear entirely normal.

B, autogenous septal bone graft without periosteum buried beneath a patient's abdominal skin for four years. There is no evidence of invasion or of reduction in size of the graft structure, and the bone cells appear entirely normal. Eight additional autogenous septal bone grafts buried for shorter periods also gave no evidence of invasion or absorption.

C, autogenous alar cartilage graft buried beneath a patient's abdominal skin for three years. Note the absence of invasion and the normal appearance of the cartilage cells. Six additional autogenous alar cartilage grafts buried for shorter periods showed no evidence of invasion or absorption.

D, autogenous elastic auricular cartilage graft buried four years beneath a patient's abdominal skin. There is no evidence of invasion, and the cartilage cells appear normal. Eleven additional autogenous auricular cartilage grafts buried for shorter periods showed no invasion or absorption of the graft structure.

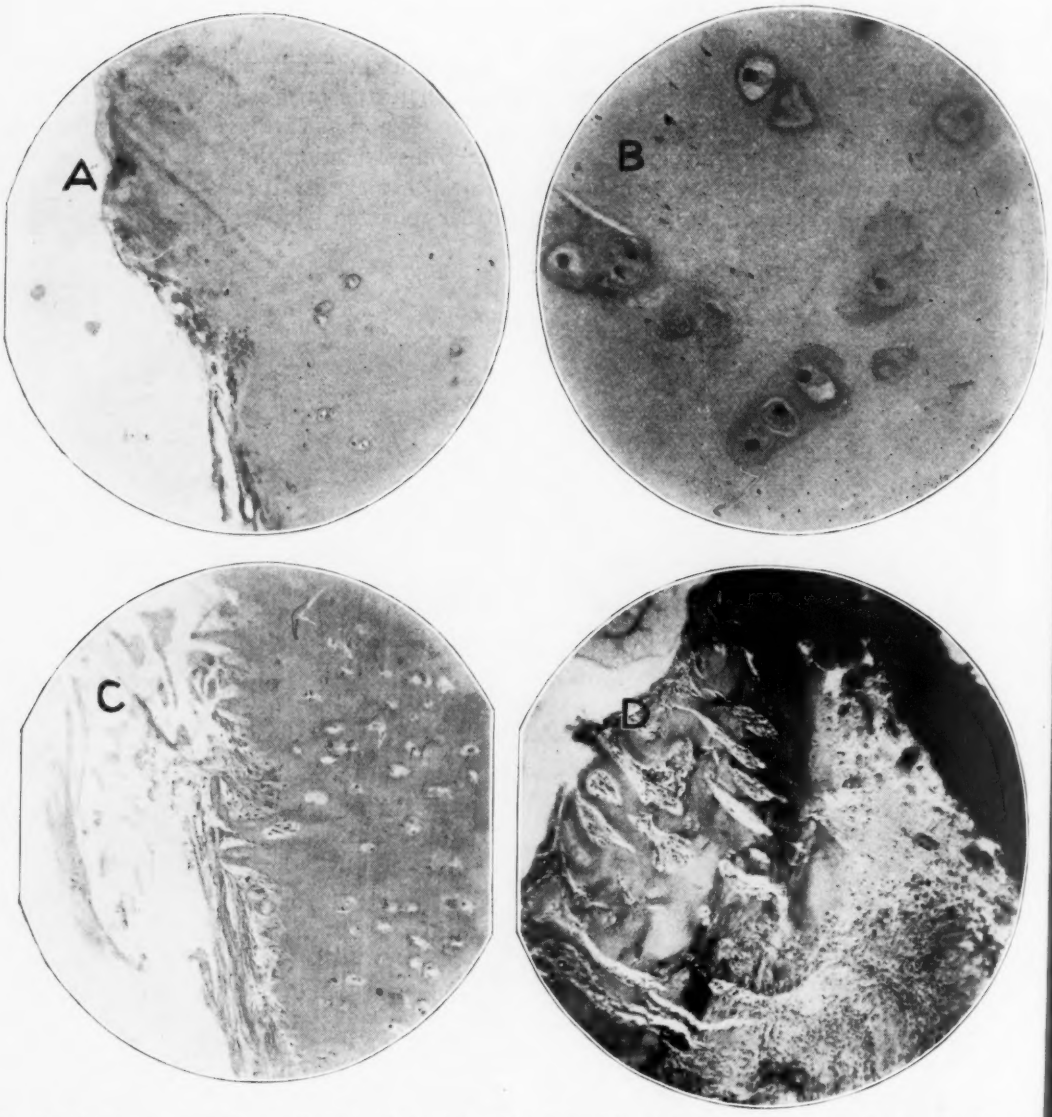


Fig. 2.—*A,* autogenous rib cartilage graft buried without perichondrium by Dr. John Staige Davis to re a saddle depression in the nose. The graft became distorted, and I removed about one third of the transplan cartilage twenty years after it had been inserted in the nose by Dr. Davis. Serial sections were made f the portion of the graft removed at operation, and all of these sections showed complete absence of invasion absorption. Both the hyaline matrix and the cartilage cells appeared entirely normal. This human autoge rib cartilage graft buried for twenty years represents the oldest of its kind to be examined microscopic thus far reported in the literature.

B, higher power magnification of the autogenous rib cartilage graft buried twenty years. Note the normal app ance of the cartilage cells twenty years after transplantation of the graft. It is the presence of these li cartilage cells that determines the fate of autogenous cartilage transplants. If the cells die following transp tation, the remaining matrix becomes a dead foreign body, which will ultimately be absorbed and replaced fibrous tissue. If the cells survive transplantation, the cartilage graft will remain as part of the living organis

Studies have been made of autogenous cartilage grafts sectioned in the fresh state soon after removal. cells in these grafts appear entirely normal, and they stain with the supravital dyes as living cells.

C, living human isogenous rib cartilage graft buried four years and two months beneath human abdominal s There is only slight evidence of invasion at the free margins, and the cartilage cells appear entirely nor Other living isogenous rib cartilage grafts buried for shorter periods have shown complete disintegration o graft structure.

D, preserved cadaveric rib cartilage buried beneath the abdominal skin of a patient for eighteen months. the absence of cell structure and the invasion of the cartilage by connective tissue, large mononuclear cells giant cells. This preserved cadaveric cartilage graft is in the process of absorption.

rule which applies to autogenous cartilage rafts is: The smaller the graft, the better are s chances of complete survival after transplanta- on. This suggests one advantage for the thin ptal cartilage graft over a thicker rib cartilage raft.

Three chief varieties of cartilage are dis- guished. In one, which is hyaline, the matrix intercellular substance is almost clear and free m obvious fibers. Actually, this matrix con- ins dense collagenous fibrils held together with binding mass of the same index of refraction, hich makes it appear homogeneous. Septal rtilage, rib cartilage and the alar and lateral rtilages of the nose are all hyaline in structure. ll may be used for grafting purposes.

The other two varieties of cartilage are termed brocartilage and are characterized by a matrix hich is pervaded by obvious connective tissue bers. When these are of a white variety, the ssue is white fibrocartilage; when they are llow elastic fibers, it is elastic fibrocartilage. he only type commonly used for grafting rposes is the yellow elastic cartilage of the ear.

Autogenous cartilage is always the material of oice for transplantation. It survives as living ssue; it is not subject to invasion or absorption, d it remains as part of the living organism til the person in whom it is transplanted dies. his is true whether the cartilage is transplanted th or without its perichondrium. Experimental udies in human subjects have demonstrated that togenous rib cartilage grafts retain their normal ructure until twenty years after transplanta- n[2] (fig. 2 *A*). Autogenous septal,[1] alar and ricular cartilage grafts also survive as living rtilage (fig. 1 *A*, *C* and *D*).

Autogenous septal cartilage is superior to alar d auricular cartilage in nasal plastic work cause of its greater bulk, which renders it eful in repairing depressions, and because of its id structure, which permits it to be used for e purpose of support.

Autogenous alar and auricular cartilages rvive equally well after transplantation, but ir thinness and tendency to curl restrict their ld of use. Autogenous septal cartilage is erefore indicated whenever a nasal defect can adequately filled or supported by the patient's tal cartilage (with the addition of septal bone en necessary). When the depression is suffi- ntly large to require rib cartilage, autogenous cartilage is the material of choice provided the patient's general condition or advanced age does not contraindicate the operation to obtain this cartilage.

When operation on the chest is contraindicated, inferior materials, such as preserved cadaveric rib cartilage or living rib cartilage from a relative, may be used. Autogenous cartilage should be used in growing children because of the possibilities of growth of young cartilage grafts (table).

LIVING ISOGENOUS CARTILAGE GRAFTS

The procedure of removing living costal cartilage from one person and transplanting it beneath the tissues of another for reconstruction of an auricle has been used rather extensively in children. Gillies[3] more recently devised a method in which cartilage removed from the mother's ear was transplanted in the child to form the structural framework for the auricle. I have been informed by men who have used this procedure that the late results are disappointing, owing to partial absorption of the isogenous auricular cartilage transplanted from mother to child.

My own clinical observations of living isogenous rib cartilage transplanted from mother to child have indicated reduction in the size of the graft over long periods. One child who had mother's rib cartilage transplanted to form an auricle rather suddenly lost the complete cartilage framework two years later.

I examined sections of an isogenous rib cartilage graft buried four years and two months and noted almost complete absence of invasion or absorption and normal-appearing cartilage cells (fig. 2 *C*). Microscopic examination of other grafts buried a shorter period showed invasion and partial absorption of the matrix and in some cases complete disintegration of the graft structure.

My impression is that living isogenous cartilage is not a reliable form of grafting material in certain cases, while in others it appears to remain as living cartilage with normal-appearing cartilage cells for long periods.

PRESERVED CADAVERIC CARTILAGE

Human cartilage preserved in alcohol was used rather extensively a generation ago to fill depressions in the nose. The procedure was discarded

2. Peer, L. A.: Fate of Living and Dead Cartilage nsplanted in Humans, Surg., Gynec. & Obst. **68**: 1939.

3. Gillies, H.: Reconstruction of External Ear with Special Reference to Use of Maternal Ear Cartilage as Supporting Structure, Rev. de chir. structive, 1937, p. 169. Greeley, P. W.: Reconstructive Otoplasty. Surgery **10**:457, 1941.

because of the belief that these grafts either suppurated or were rapidly replaced by fibrous tissue.

O'Conner in collaboration with Pierce [4] revived the method, utilizing fresh cadaveric rib cartilage preserved in aqueous merthiolate solution and kept at refrigeration temperature until used. This preserved type of cadaveric cartilage has a wide field of use and represents a valuable contribution to plastic surgery.

Experimental studies with septal and rib cartilage grafts preserved in alcohol and buried in human tissue have demonstrated that over long periods these grafts are slowly invaded and replaced by fibrous tissue.[2] Their application, therefore, should be limited to cases in which it is not expedient to use autogenous cartilage grafts.

The Amount of Growth Occurring in Various Cartilage Grafts

Type of Cartilage Graft; Age of Child	Measurement When Transplanted	Time Buried	Measurement When Removed	Increase in Size
Septal cartilage graft without perichondrium Age: 7 yr.	Length 8/32 in. (6 mm.) Width 5/32 in. (4 mm.)	1 yr., 6 mo.	Length 10/32 in. (8 mm.) Width 6/32 in. (4.5 mm.)	Length 2/32 in. (1.5 mm.) Width 1/32 in. (0.75 mm.)
Rib cartilage graft with perichondrium on one side Age: 4 yr.	Length 1 in. (25 mm.) Width 10/32 in. (8 mm.) Thickness 6/32 in. (4.5 mm.)	1 yr.	Length 1 4/32 in. (28 mm.) Width 11/32 in. (8.5 mm.) Thickness 7/32 in. (5.5 mm.)	Length 4/32 in. (3 mm.) Width 1/32 in. (0.75 mm.) Thickness 1/32 in. (0.75 m
Rib cartilage graft with perichondrium on one side Age: 2 yr.	Length 1 10/32 in. (33 mm.) Width 10/32 in. (8 mm.) Thickness 6/32 in. (4.5 mm.)	1 yr., 3 mo.	Length 1 13/32 in. (35 mm.) Width 12/32 in. (9 mm.) Thickness 6/32 in. (4.5 mm.)	Length 3/32 in. (2 mm.) Width 2/32 in. (1.5 mm.) None
Auricular cartilage without perichondrium Age: 1 yr., 10 mo.	Length 15/32 in. (11.5 mm.) Width 5/32 in. (4 mm.)	1 yr.	Length 17/32 in. (13 mm.) Width 6/32 in. (4.5 mm.)	Length 2/32 in. (1.5 mm.) Width 1/32 in. (0.75 mm.)
2 auricular cartilages without perichondrium; same patient Age: 2 yr., 1 mo.	Length 14/32 in. (11 mm.) Width 4/32 in. (3 mm.)	2 yr.	Length 16/32 in. (12.5 mm.) Width 5/32 in. (4 mm.)	Length 2/32 in. (1.5 mm.) Width 1/32 in. (0.75 mm.)
Auricular cartilage graft without perichondrium Age: 1 yr., 11 mo.	Length 15/32 in. (11.5 mm.) Width 5/32 in. (4 mm.)	2 yr., 3 mo.	Length 18/32 in. (14 mm.) Width 7/32 in. (5.5 mm.)	Length 3/32 in. (2 mm.) Width 2/32 in. (1.5 mm.)
2 rib cartilage grafts with perichondrium * Age: 2 yr., 3 mo.	Length 1 8/32 in. (31 mm.) Width 8/32 in. (6 mm.) Thickness 6/32 in. (4.5 mm.)	2 yr., 2 mo.	Length 1 8/32 in. (31 mm.) Width 8/32 in. (6 mm.) Thickness 6/32 in. (4.5 mm.)	None
2 rib cartilage grafts without perichondrium * Age: 2 yr., 3 mo.	Length 10/32 in. (8 mm.)	2 yr., 2 mo.	Length 10/32 in. (8 mm.)	None

* These rib cartilage grafts were buried in the same patient.

THE GROWTH OF CARTILAGE GRAFTS

Normal growth of all cartilage structures in the body during childhood takes place from the deep layer of connective tissue cells of the perichondrium, which form a matrix substance about themselves, separate from the perichondrium and become cartilage cells. Growth also occurs by division of cartilage cells, followed by the production of matrix about each cell, separating them one from another.

After adult life, cartilage ceases to grow, an there is considerable doubt concerning its powe of regeneration after injury; a wound in cartila usually is filled in with connective tissue, wi little if any formation of cartilage.

Adult autogenous cartilage grafts maintai their cartilaginous structure following tran plantation but neither increase nor decrease size, the property of growth being absent in adu cartilage.

Dupertuis [5] in 1941 demonstrated the actu growth of young auricular and costal cartila grafts in rabbits, which indicated the possib importance of using autogenous grafts in t growing child. Following Dupertuis' work wi rabbit cartilage, I buried 11 autogenous cartila grafts, after careful measurement, in 7 infan and small children; I removed the grafts intervals of one year to two years and thr months after transplantation. The grafts we measured again at the time of removal (table

A study of these measurements demonstrat that all of the thinner auricular and sep cartilage grafts increased somewhat in size. T of the thicker rib cartilage grafts showed appreciable increase, but 4 rib grafts buried the same person showed no growth after t years and two months. This demonstrates

4. Pierce, G. W., and O'Conner, G. B.: Reconstructive Surgery of the Nose, Ann. Otol., Rhin. & Laryng. **47**:437, 1938.

5. Dupertuis, S. M.: Actual Growth of You Cartilage Transplants in Rabbits, Arch. Surg. 43 (July) 1941.

dividual variation in the rate and the amount growth of some thick rib cartilage grafts which as not evident with the thinner septal and ricular cartilage grafts.

The average rate of increase for the thin grafts as about $\frac{2}{32}$ inch (1.5 mm.) in length over a eriod of two years. In twelve years this same te of growth would amount to $\frac{3}{8}$ inch .5 mm.), which is a sufficient increase to demonstrate the possible importance of using autogenous cartilage grafts in growing children so that growth of the transplanted cartilage will keep pace with the general growth of the region grafted. All of the cartilage grafts on section showed normal-appearing cartilage cells and matrix with complete absence of invasion or degeneration. Both the elastic auricular cartilages and the hyaline septal and rib cartilages main-

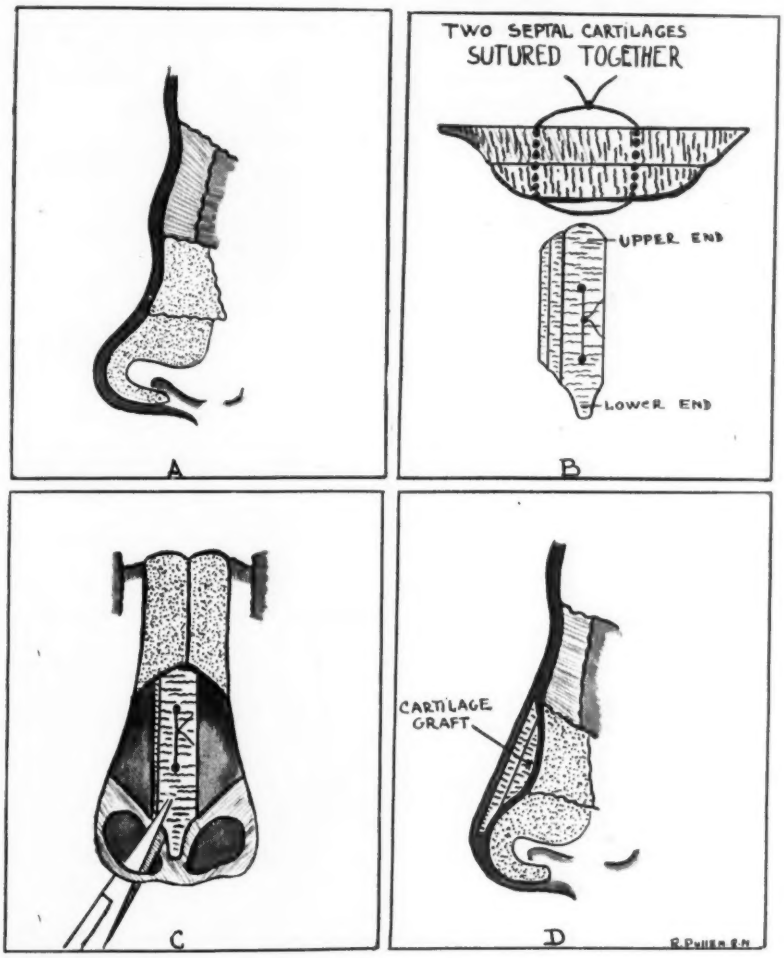


Fig. 3.—*A*, diagram illustrating a moderate saddle depression in the lower portion of the nose. The bony dge is not depressed.

B, diagrams illustrating two segments of septal cartilage sutured together with a mattress suture of plain gut. In this case two segments of cartilage are required to provide sufficient bulk for repair of the saddle; single segment of the same thickness would suffice if it were available. Note shaping of the graft at the er end where it fits in the groove between the domes of the alar cartilages. The upper end must be beveled correspond with the downward slope from the bony bridge. The under surface of the graft must conform h the base on which it rests; otherwise distortion due to scar contracture will occur postoperatively.

C, insertion of a graft to fill a saddle depression through an incision inside the nose, the skin having been viously undermined in this area by scissors dissection. Note that the pointed lower end of the graft fits the groove between the two alar cartilages. The beveled upper end, which is not quite in the proper posi-, slopes downward from the bony bridge, with which it forms a neat junction.

D, lateral view of the nose with the cartilage grafts in position. The graft is incorrectly illustrated as being her than the level of the bony bridge. Note that the general contour of the graft snuggly fits the contour the base on which it rests. This prevents shifting of the implant postoperatively. It is also good practice nsert a silk mattress suture beneath the graft. This suture is tied on the outside of the nose and helps to kin the graft in position and prevent hematoma. (See figure 4 *E*.)

tained their characteristic structure as yellow elastic cartilage and hyaline cartilage, respectively. The conception that all forms of human autogenous cartilage grafts survive following successful transplantation, together with the evidence presented that young human cartilage grafts tend to increase in size, is important in the planning of many types of facial reconstruction in young children.

Thus in the congenital bifid nose the later and alar cartilages may be widely separated fr their covering tissues for relaxation and sutur together to narrow the nose with the knowled that these cartilages will not only survive b also grow to some extent. Following fractu and narrowing of the bony bridge, a segment the child's rib cartilage may be inserted in nose to fill the saddle and support the nasal

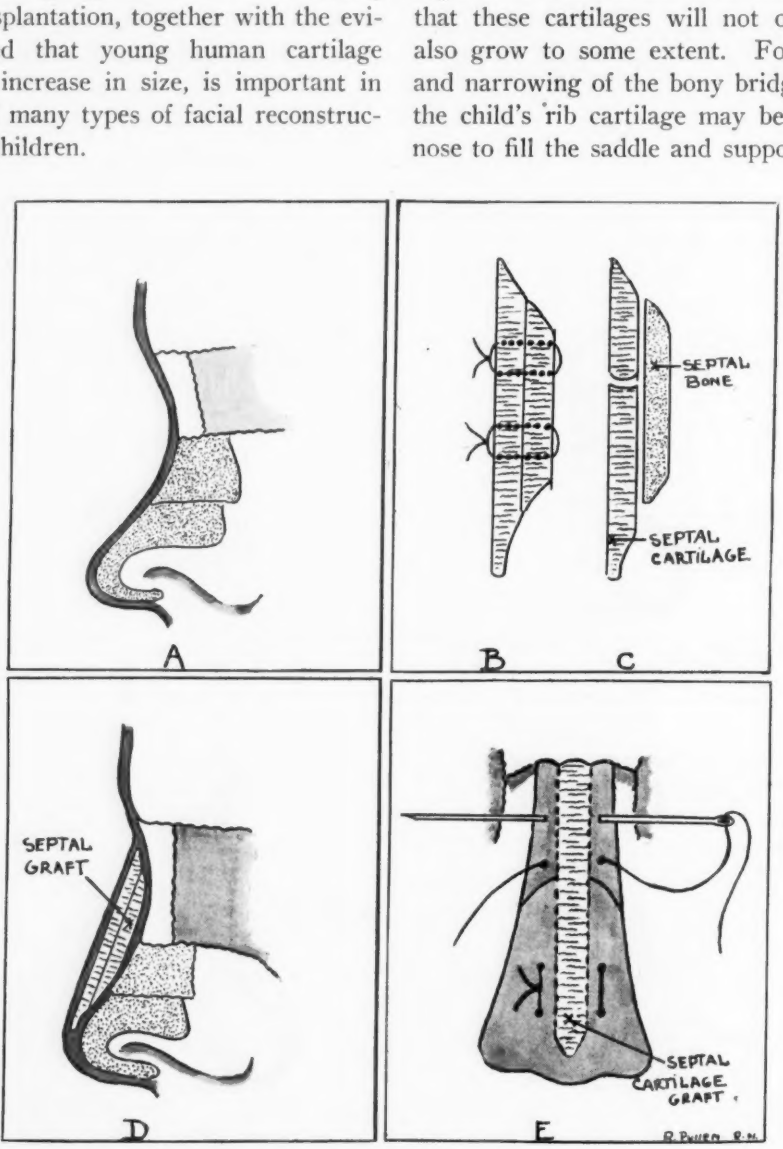


Fig. 4.—Septal cartilage and bone grafts for repair of deep saddle nose:

A, diagram illustrating a deep saddle depression in the nose. The bony bridge as well as the lo part of the nose is involved in this depression. Many cases of this type can be satisfactorily repaired by izing septal cartilage, supplemented with septal bone when necessary. (See figure 1 *B*.) Rib cartilage (e autogenous or preserved cadaveric cartilage) may be used when sufficient septal cartilage and bone are available.

B, diagram illustrating two segments of septal cartilage sutured together by mattress sutures of plain ca Three or more segments may be utilized when a thicker graft is required. Note the shaping of the graf conform with the contour of the base on which it is to rest. (See figure 3 *B*.)

C, diagram illustrating method of utilizing two segments of septal cartilage and one segment of septal for the graft which must be formed from the available septal cartilage and bone. The arrangement of the s segments forming the graft depends on the size of the available segments and the depth of the cavity. In eral, it is advantageous to form the upper layer of the graft from cartilage which can be easily shaped a scalpel.

D, septal cartilage graft in place, filling saddle depression.

E, diagram illustrating the insertion of mattress sutures through the nose. These sutures pass beneath graft and are tied on the outside of the nose. They serve to retain the graft in position and prevent hema

is rib cartilage also will survive transplanta-
n as living cartilage and serve as a permanent
pport for the nasal structures with the possi-
ity of some gradual increase in the size of
e graft.

There is evidence that the insertion of a glass
here in a child's retracted eye socket influences
re normal development of the bony orbit,
ich otherwise would remain small. A segment
the child's rib cartilage inserted in the re-
cted socket might stimulate greater develop-
nt of the bony orbit if the cartilage implant

whether performed by the Metzenbaum, the Cohen or the Salinger technic, depends on the principles of survival and growth of cartilage grafts.

The purpose of this paper is to emphasize that all forms of human autogenous cartilage grafts survive successful transplantation as living cartilage and to present evidence that young human cartilage grafts grow. The procedures illustrated by diagrams are mechanical methods of utilizing one or both of these principles to meet the requirements for certain types of cases.

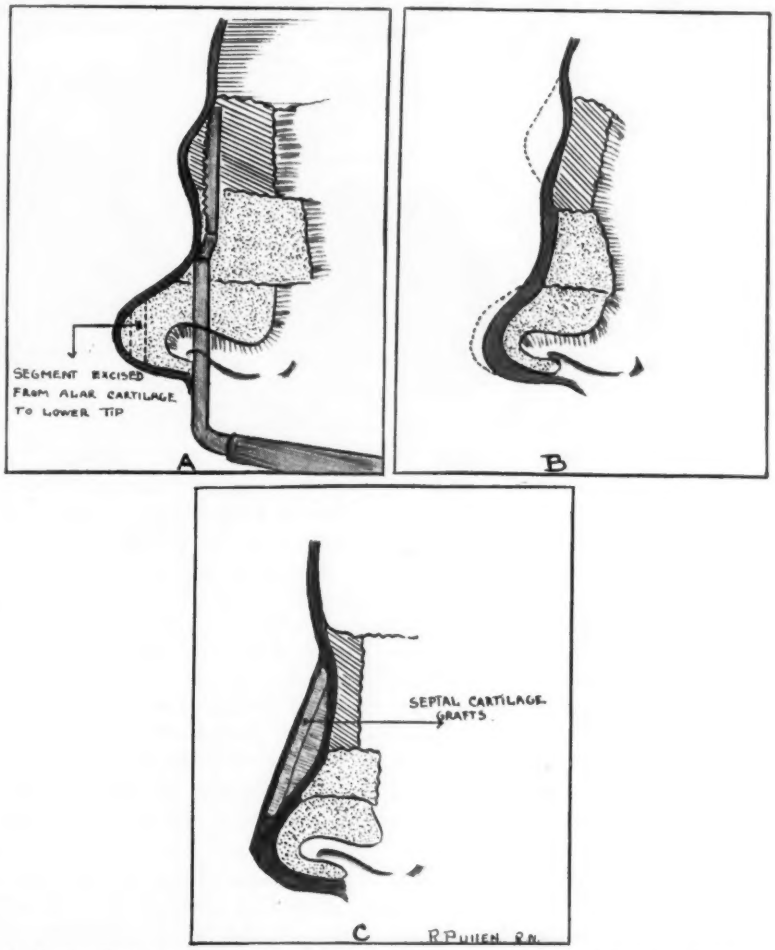


Fig. 5.—Method of simplifying the repair of deep saddle nose with a high bony bridge and a high tip:
A, diagram illustrating a deep saddle depression in the lower part of the nose. Since the nose was orig-
y too high, the bony bridge and the nasal tip are first lowered to a more normal height. This decreases
depth of the saddle depression.
n *B* dotted lines indicate the previous position of the bony bridge and the nasal tip. Note the reduction
epth of the saddle depression.
C, two septal cartilage segments inserted as in figure 3 to fill the saddle depression. By first providing a
al height for the nose and then filling the reduced saddle depression, one obtains a more normal-appearing

dually increased in size following transplanta-

he success of readjustment operations for the
r border of the septal cartilage in children,

CLINICAL SUGGESTIONS FOR SEPTAL CARTILAGE GRAFTS

The nasal cavities are unsterile fields, and when septal cartilage is removed, it is con-

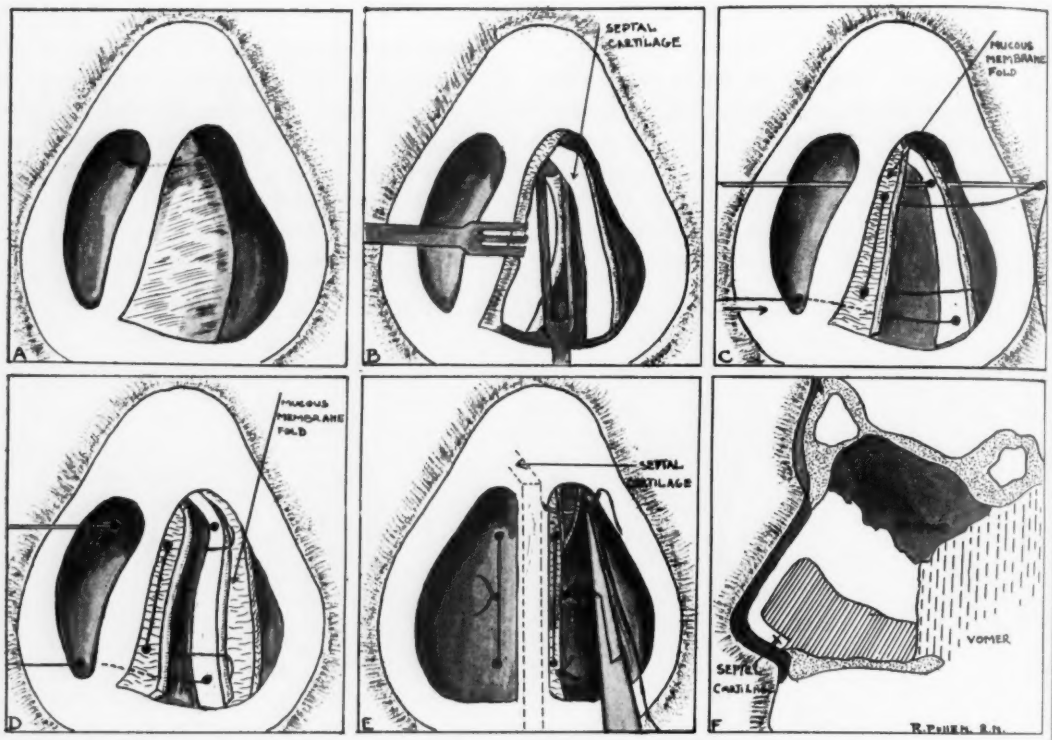


Fig 6.—Method of repair for displacement of the lower border of the septal cartilage:

A, diagram illustrating a displacement in which the lower free border of the septal cartilage has been m into the left nostril. The columella is displaced to the right, the right nostril is small, and the left nostri correspondingly wide. Often the nasal tip will be distorted away from the midline.

In *B* an incision is made in the mucous membrane over the protruding free border of the septal carti and the mucous membrane elevated so as to expose completely the septal cartilage on each side, thus rende it a free graft. This differs from the Metzenbaum technic, in which the mucous membrane is left attache one side of the cartilage. In my hands, this attachment has prevented free manipulation of the cartilage. incision is then made through the cartilage about one-eighth inch (3 mm.) behind the free border so th bar of cartilage is formed for the support of the nasal tip. The Ballanger swivel knife is then inserted in upper end of this incision and carried backward leaving a bar of cartilage along the nasal dorsum. This of cartilage along the dorsum is continuous with the upright bar of cartilage at the nasal tip.

The Ballanger swivel knife is then directed downward to the floor of the nose and forward along the of the nose, removing a small or a large amount of cartilage, depending on the requirements of the case. children only a small amount should be removed.

In *C* a pocket is made between the cutaneous folds of the columella, and the base of the upright carti bar is separated from the floor of the nose. The diagram shows the insertion of a silk mattress suture w is designed to draw the bar of cartilage between the cutaneous folds of the columella. Proper use of suture will not only replace the cartilage in normal position but also draw the columella into correct rela ship, restore width to the narrow right nostril, and draw the nasal tip over to a correct midline position.

In *D* traction on the mattress suture is in the process of drawing the cartilage segment into the colum pocket. Note the mucous membrane fold on the left side, which was not shown in previous diagrams.

In *E* the mattress suture which retains the septal cartilage bar in the columellar pocket is tied. This serves to keep the folds of skin in contact with the cartilage and to prevent hematoma. The original inc in the mucous membrane is shown partially sutured.

F, lateral diagrammatic view showing the extent of cartilage removed in the lined area. Note the up septal cartilage bar continuous with the beam of cartilage along the nasal dorsum supporting the nose.

Some adults may require adjustment of the alar cartilage, but I have not found this necessary in y children.

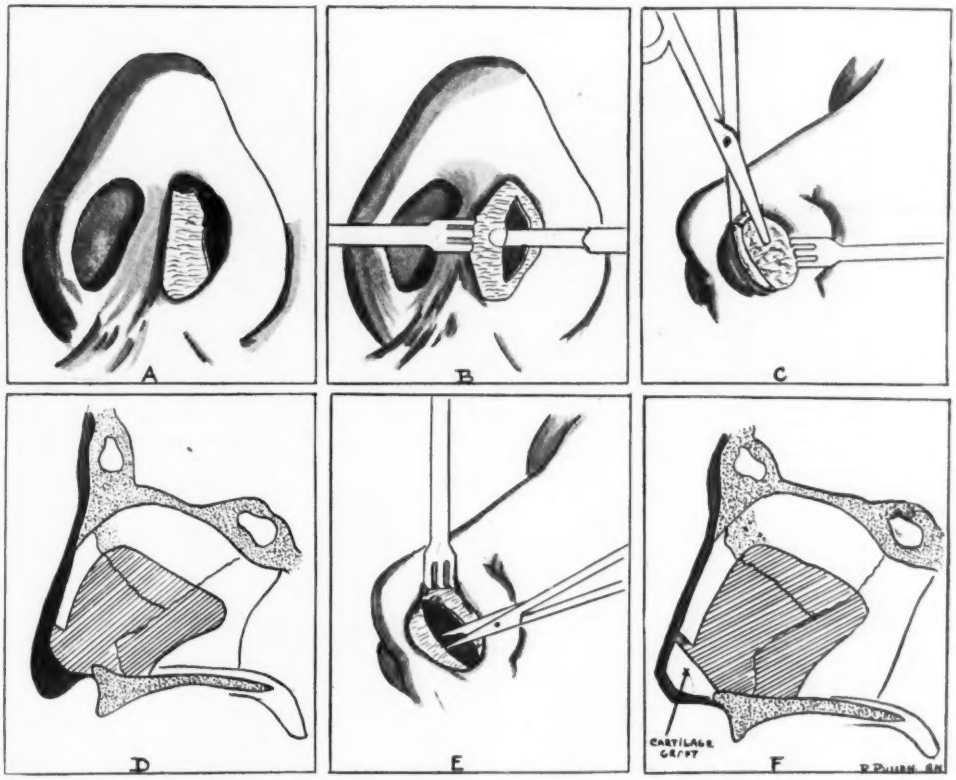
Complete exposure of the septal cartilage bar does not interfere with survival of the cartilage and in y children the nose appears to grow and develop normally after this operation.

minated by contact with the nasal mucous embrane, the skin of the vestibule or the gloves the operator. In spite of this contamination, tal cartilage seldom becomes infected after nsplantation provided it is inserted in healthy sues and firm pressure applied to prevent matoma.

If blood collects about the graft, separating it m direct contact with the surrounding tissues, ich are its source of nourishment, infection of me degree is apt to follow. This infection will se rather rapid destruction of the graft.

When a septal cartilage graft is inserted between the two mucous membrane layers of the septum or in a pocket between the two cutaneous folds of the columella, one should always insert a mattress suture to hold the tissues firmly against the cartilage graft. Simpson sponges reenforced with petrolatum gauze packing in the nostrils provide additional security against hematoma. The sponges and the gauze may be removed in two days; the mattress sutures, in four to six days.

When a septal cartilage graft is inserted along the dorsum of the nose to fill a saddle depres-



ig. 7.—Method of repair for displacement of septal cartilage when it is thickened and distorted:
A, displacement in which the lower free border of the septal cartilage has been moved into the left nostril. displaced cartilage is too thickened and distorted to permit satisfactory replacement between the cutaneous s of the columella.
n *B* an incision has been made over the lower free border of the cartilage and the mucous membrane ele- d on each side. The cartilage is thus completely exposed.
C, excision of the distorted lower segment of the septal cartilage.
D, cross section of the nose after the removal of the distorted lower segment of septal cartilage. Note sag- of the nasal tip due to lack of cartilaginous support. Sufficient septal cartilage and bone are removed to ide good breathing space.
n *E* a pocket is made between the cutaneous folds of the columella and a straight segment of septal car- e is inserted in this pocket to support the nasal tip.
, cross section showing the septal cartilage graft in place. The mucous membrane is then replaced over sides of the graft and a silk mattress suture inserted through the columella to retain the graft in position prevent hematoma. When the displaced lower border of the septal cartilage is not too thickened or dis- d, the surgeon may elect to replace the segment as illustrated in figure 6. Both of these procedures utilize l cartilage as a free graft. There are many possibilities for the use of septal cartilage grafts in operations e nose, and when the otolaryngologist understands that autogenous septal cartilage grafts are reliable, he se them for a wide variety of conditions.

sion, it is usually best to retain the graft in position by a mattress suture which passes through the nasal skin from the outside and lies beneath the graft. A firm adhesive tape strapping on the outside of the nose and a carefully molded dental stent covering will prevent hematoma about the implant and keep it in contact with the surrounding tissues. The mattress suture passing through the nose should be removed at the end of two days to prevent stitch scars.

operation in which projecting portions of t graft are removed.

Alterations in the shape of the graft can u ally be prevented by shaping the cartillage that it accurately fits the contour of the tiss on which it rests. This is of considerable i portance to insure an even line for the dors of the nose.

It is a good routine to bury all excess sep cartilage and bone removed at submucous op ation in a subcutaneous pocket beneath

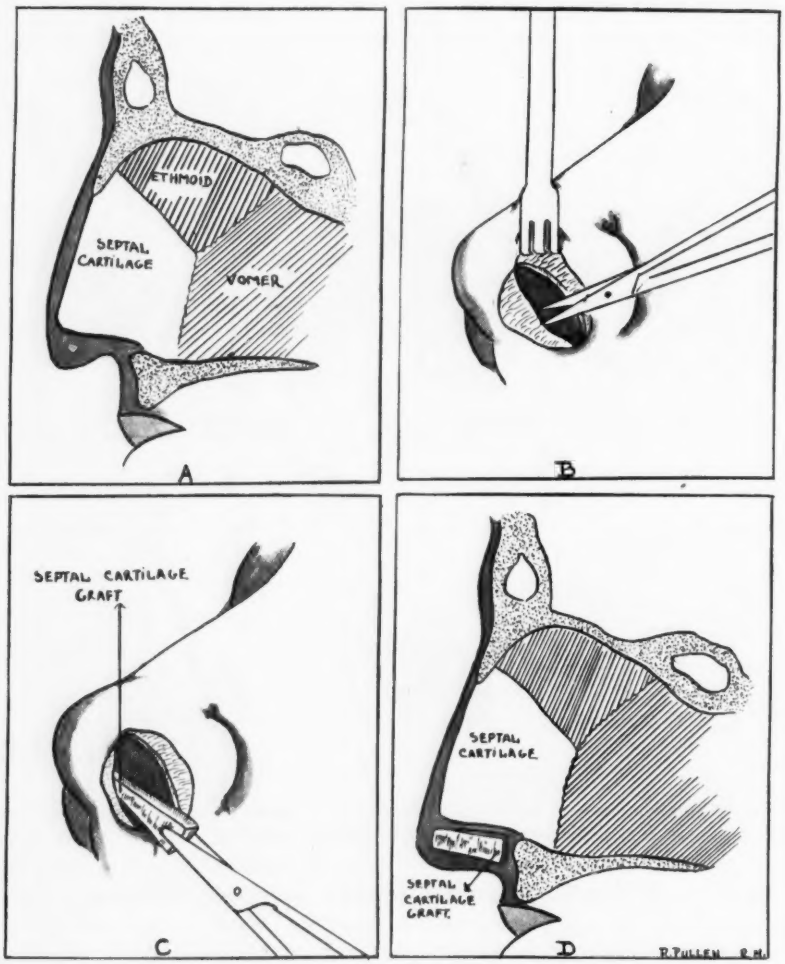


Fig. 8.—*A*, drawing illustrating retraction of the columella due to a deficiency of the lower border of septal cartilage. This often results from fracture of the septum with backward displacement of the fract segment.

In *B* a pocket is formed in the columella by scissors dissection.

In *C* a segment of the patient's septal cartilage is inserted in this pocket to provide support for the retr columella. The incision in the mucous membrane is sutured to cover the cartilage graft and a silk mat suture inserted through the columella to retain the graft in position.

D, lateral view showing the septal cartilage graft in position.

Occasionally a septal cartilage graft may undergo a change in shape due to twisting or bending following transplantation. This complication can be corrected by a later trimming

patient's abdominal skin. If the graft ins in the nose becomes infected and it is lost cartilage and the bone in the abdominal p will provide living grafts for a second r

the saddle nose. I have been surprised to te that septal bone grafts without periosteum rvive in abdominal pockets for periods up to ur years following transplantation, whereas b and tibial bone in abdominal pockets com- letely disappear in seven months. Septal bone ay therefore be used to supplement septal rtilage grafts where a large cavity is to be lled (fig. 1-*B*).

During the past few years oral sulfathiazole erapy has been administered to all patients whom septal cartilage grafts have been trans- planted. This medication is begun twenty-four hours after operation and continued for five days as a precaution against possible infection of the cartilage transplants. In a series of 112 graftings of septal cartilage during the past two years in which sulfathiozole was used, only 1 infection occurred. Occasionally the septal cartilage grafts have been peppered with sulfanilamide before transplantation when the tissues had not been infiltrated with procaine hydrochloride, which is antagonistic to the action of the drug.

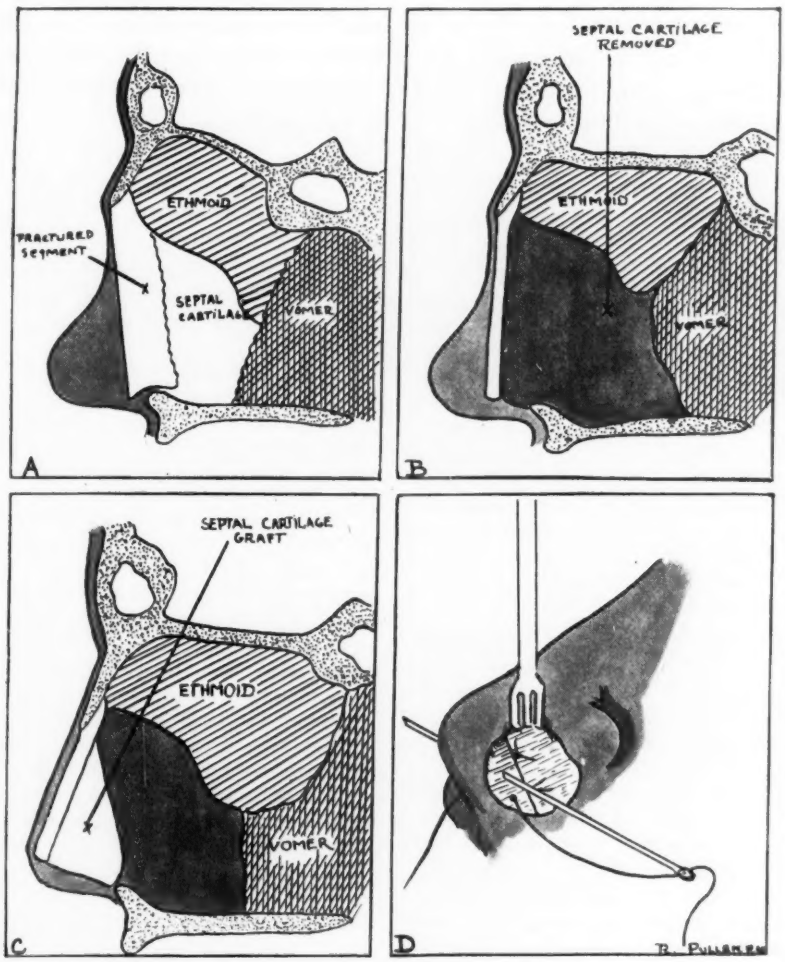


Fig. 9.—*A*, lateral diagrammatic drawing showing a saddle depression resulting from an old fracture of the al cartilage with downward displacement of the upper fragment.

In *B* all of the septal cartilage has been removed except a beam of cartilage beneath the dorsum of the nose.

In *C* a triangular cartilage graft cut from the septal cartilage removed during the submucous resection is rted to support the nasal dorsum. The flat angle of this graft rests in the region of the nasal spine, and long upper border extends from the nasal tip to the bony bridge. The lower free edge fits in a columella ket, where it is held in place by a mattress suture. The mucoperichondrial flaps are held firmly against the t by grease packing in each nasal cavity.

The septal cartilage graft serves as a prop to elevate the beam of cartilage left beneath the dorsum of the , thus correcting the saddle depression. The removal of the thickened and deflected septal cartilage restores breathing space.

In *D* the mucous membrane incision is sutured to cover the graft, and a mattress suture is inserted through the mella to hold the graft in position.

SUMMARY

The general belief that autogenous septal cartilage grafts do not survive after transplantation is erroneous. Autogenous septal cartilage, alar cartilage, lateral cartilage and rib cartilage all survive after transplantation as living cartilage. All may be used successfully for grafting purposes.

Autogenous septal cartilage is superior to alar and auricular cartilage only because of its greater bulk and firmer structure. It is superior to rib cartilage because it is more readily obtainable.

Autogenous septal cartilage should be used whenever a nasal defect can be adequately supported by the patient's septal cartilage (with the addition of septal bone when necessary).

When the nasal depression is sufficient large to require rib cartilage, autogenous cartilage is the material of choice. Preserv cadaveric cartilage may be used in debilitat or elderly patients.

Experimental observations indicated actu growth of young human auricular and sep cartilage grafts. The more bulky young cartilage grafts increased in some cases and others showed no increase in size.

Septal bone grafts without periosteum tra planted beneath the abdominal skin retain their normal bone structure for periods up four years after transplantation. Rib and til bone with and without periosteum transplant beneath the abdominal skin completely dis peared seven months after transplantation.

965 Broad Street.

NEOPLASMS OF BOTH MAXILLARY SINUSES

MEYER D. BERGER, M.D.
BROOKLYN

Because of the apparent rarity of this case in hich both maxillary antrums were invaded by eoplasm, a careful scrutiny of the literature was ndertaken in order to determine whether any ch case had been previously reported. During e past twenty years there has been no report of ase of bilateral neoplastic involvement of the trums. It therefore seems appropriate to de- ribe this unusual occurrence in which a tumor each antrum was diagnosed, successfully eated and apparently cured thus far.

REPORT OF A CASE

A man 62 years of age, referred by Dr. A. Leavitt, as seen on Sept. 17, 1940 because he had undergone eated epistaxis in the past week. A careful taking the history of the patient failed to reveal any other mptom.

Examination showed profuse bleeding from the right is. The sanguination was sufficiently curtailed by lications of epinephrine hydrochloride to allow for rough inspection of the nasal chambers and the naso- rynx. The bleeding point was visualized in the erior cleft of the right middle meatus. My first in- ation was to attribute the bleeding to an erosion of anterior ethmoidal artery such as that which one asionally sees in arteriosclerotic patients. However, ther inspection revealed a small granulomatous mass, ut 0.5 cm. in diameter, as the source of the epistaxis. provisional diagnosis of neoplasm was made because the appearance of the mass and its tendency to bleed. nfirming this diagnosis, transillumination showed a ck antrum on this side, with all the other accessory uses perfectly clear. An antral puncture produced a ntaneous hemorrhagic return through the trocar even re the commencement of irrigation. The latter find- might well be associated with a neoplasm of the rum or bleeding into this sinus from the hemorrhagic s in the middle meatus. Nevertheless, the irrigation with a great deal of resistance, thus somewhat stantiating the original concept of an antrum filled h a tumor mass.

iopsy.—Tissue was taken from the granuloma in the dle meatus for biopsy. The report was that of an nomatous polyp with a suggestion of anaplastic tissue, cating the possibility of cancer.

ntgen Examination of the Sinuses (Dr. B. Ep- n).—The frontal sinuses were small, and their walls t thick. A slight haze was noted over the right ntal sinus. Both ethmoid sinuses were well aerated. sphenoid sinuses were likewise within normal limits. right antrum was obscured by a dense opaque shadow, which could also be noted in the view taken of the sphenoid sinuses (fig. 1). The mesial wall of the antrum appeared thinned, and the posterior aspect of the lateral wall also appeared thin. The left antrum was clear. The impression was that of a pathologic condition of the right antrum.

Although the diagnosis of cancer had not been fully established, I decided to perform a Caldwell-Luc operation instead of waiting for an aspiration biopsy done according to the technic of Martin and Ellis. If there should be any doubt of the lesion on opening the antrum, a frozen section might be made. This diagnostic and therapeutic measure in contrast to a resection of the superior maxillary bone was further acceptable because of the belief that we were confronted with an early neoplastic lesion which had not extended beyond the bony confines of the antrum.

First Operation.—A Caldwell-Luc radical antrotomy was performed, with the patient under local anesthesia, exposing an antrum filled with a tumor mass which had already eroded through the posterior bony wall, the posterior half of the bony floor and most of the mesial wall. The other walls, though intact, were rather like eggshell in consistency. Despite the erosion of bone, the neoplasm appeared well encapsulated and had not infiltrated macroscopically into the adjacent soft tissues. The entire growth was exenterated with diathermy, and the exposed soft parts, such as the sphenopalatine fossa, were coagulated. An ethmoidectomy was then performed and revealed an erosion of the lamina papyracea. The Caldwell-Luc incision was not sutured.

Pathologic Examination of Specimen (Dr. D. Grayzel).—The specimen consisted of numerous irregular, soft, friable portions of yellow-gray tissue intermixed with some clotted blood, fixed in solution of formaldehyde U. S. P. 1:10. The portions of the tissue measured up to 3 by 1.3 by 1.7 cm. and together weighed 10 Gm. The cut surfaces of the tissue were variegated in appearance. They were yellow-gray and somewhat translucent and contained irregular small areas of hemorrhage.

Microscopically the preparation had a somewhat variegated appearance. In some places the tumor cells were seen mounted on delicate connective tissue stalks. They were cylindric or irregularly polygonal in shape. The cytoplasmic borders were distinct. The cytoplasm in some was more abundant and somewhat basophilic. The nuclei of the cells varied in size, shape and staining reaction. Some were in mitotic division. Occasional nuclei contained nucleoli. In other areas the cells were loosely arranged and appeared to grow irregularly in cords and strands. Many of the cells were giant cells and contained more than one nucleus. The stroma in places was scanty, while in other areas it was abundant and densely infiltrated by mononuclear cells and polymorphonuclear leukocytes. In places there were areas of necrosis and foci of extravasated blood. The diagnosis was papillary carcinoma, grade IV.

From the Otolaryngology Service of E. Leo Berger, D., of the Brooklyn Jewish Hospital.

Laboratory Data.—Chemical examination of the blood showed sugar 85 mg. and urea nitrogen 22.2 mg. per hundred cubic centimeters. The Kline test was negative. The hemoglobin content was 82 per cent; the red blood cell count was 4,100,000; the white cell count was 12,700, with polymorphonuclear leukocytes 71 per cent, band forms 2 per cent, lymphocytes 18 per cent, monocytes 6 per cent and eosinophils 3 per cent. The urine was normal.

Roentgen Therapy (Dr. L. Nathanson).—The patient received postoperative radiation therapy from October 5 to November 9 as follows: High voltage roentgen rays were administered anteriorly to a total of 4,800 roentgens (r) and laterally to a total of 1,500 r, directed to the maxillary sinus and surrounding areas. A 6 cm. portal was used in each instance. A first and a second degree reaction developed but rapidly subsided. The factors were filtration through 0.5 mm. of copper and 2 mm. of aluminum and a target distance of 50 cm., and the radiation was applied at the rate of 200 r per treatment.

Postoperative Course.—While the patient was receiving this therapy, the antrum was irrigated several times

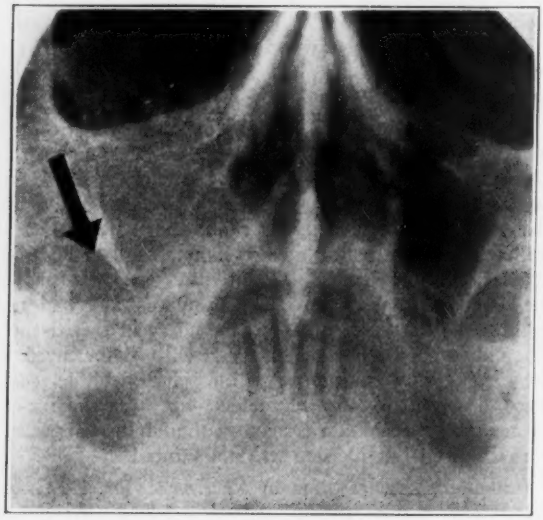


Fig. 1.—Roentgenogram taken Sept. 17, 1940. The arrow indicates the right antrum, which is filled with neoplastic tissue. The mesial wall of this sinus appears thin. The left antrum is perfectly clear.

a day with warm sodium bicarbonate solution in order to eliminate any possible collection of detritus or infection. The postoperative course was uneventful and consisted of keeping the transcanine incision and the antral window patent for hygienic purposes and for possible use of radium implants. The antrum healed completely with a large transcanine fistula and a large antral window, without evidence of recurrence.

On Jan. 25, 1941 a routine roentgen examination was made to determine the status of the right antrum. The report (Dr. L. Nathanson) was: "Restudy of the sinuses shows the right maxillary sinus to be much better aerated than it was originally—that is, from the studies on Sept. 18, 1940. The aeration is particularly noted in the midportion of the sinus. Some thickened membrane is present about the margins. The mesial wall of the sinus appears to be thinned out as compared with the original study, which may be due to the surgical alteration that was performed. Incidentally, one notes the presence of a large polyp (fig. 2 *A* and *B*) or a cyst arising from the lateral wall of the left maxillary sinus. The tumefaction is sharply defined."

At this time, unfortunately, the latter observation of polyp in the left antrum was minimized, because the thought of another neoplasm in this antrum was not entertained. However, on May 23, during the usual follow-up care of the right antrum, the patient complained that there had been several episodes of bleeding from the left naris. On being interrogated further, he stated that he had experienced moderate frontal and antral pains on this side.

Examination revealed that both nasal chambers were normal except for the old right antral window. The left cheek was slightly tender and swollen. On palpation of the soft tissues in the left canine fossa, one became aware of an indurated mass. In the buccogingival recess, there was a shallow ulceration about 1 cm. in length. Transillumination elicited a total black left antrum.

Roentgen Examination of the Sinuses (Dr. L. Nathanson).—A study of the nasal accessory sinuses at this time, with particular reference to the left maxillary sinus, was reported as follows: "In the original study of Jan. 18, 1941 one could demonstrate a circumscribed soft tissue shadow arising from the lateral upper wall of the left maxillary sinus and extending into the nasal space. The outer margins were sharply delineated, and the growth could be demonstrated from several views. At this time the entire sinus is completely opaque (fig. 2 *C*), and the comparison indicates a rapid growth of this tumor which we at that time considered as being a polyp developing within the sinus. One also notes at this time that the lateral wall of this sinus has been thinned out considerably, and I believe that the entire wall has been displaced somewhat laterally. There is also evidence of increased density within the nasal chamber on the left side, and one must consider the possibility of extension of the lesion into the nose itself. A somewhat unusual finding is that the nasal bones on the left side are not as well visualized as they are on the right. This was present in the study of January 18 and has not changed appreciably during this interval. It is possible that the growth which we visualized a few months ago was a second neoplasm of the sinus and that it has progressed to produce the present finding."

In view of both the clinical and the roentgen findings my impression was that we were dealing with a neoplasm of the left antrum too. Consequently, the patient was hospitalized for the indicated surgical treatment.

Second Operation.—A Caldwell-Luc radical antrotomy was performed on the left side, with the patient under local anesthesia. A tremendous mass had eroded through the entire anterior antral wall and had to be dissected free from the soft tissues of the cheek. There were also erosions of part of the lateral wall and of a small area of the posterior wall, with diffuse thinning of the other walls. The tumor mass filled the entire antrum, and its center contained a gelatinous chocolate colored fluid. Diathermy was employed in the destruction of this tumefaction, which was exenterated in toto. The soft parts which were exposed by bony erosion were electrocoagulated. A large window was established, draining into the inferior meatus, and the transcanine incision was kept patent.

Pathologic Examination of Second Specimen (Dr. Grayzel).—This specimen consisted of numerous irregular pieces of moderately firm pink, red and pus tissue, fixed in solution of formaldehyde U. S. P. and measuring up to 5.5 by 2 by 1 cm.

Microscopic preparations from the different fragments owed a somewhat variegated appearance. In some aces the surface was covered with pseudostratified ated columnar cells. The subjacent tissue was loose, ematous and infiltrated by small round cells, large nonuclear cells, plasma cells, some eosinophils and casional polymorphonuclear leukocytes. The capil-ies were engorged, and there were foci of extravasated od. In other fragments bony spicules were seen plasma cells. There was a variation in the size and the shape of the cells, and many contained hyperchromatic nuclei. In still other areas there were groups of large cells with clear cytoplasm, distinct cytoplasmic borders and relatively small vesicular nuclei. These cells resembled somewhat those seen in hypernephroma. In places some of these cells appeared to be mounted on connective tissue stalks. Still other fragments consisted of hyalinized fibrous connective tissue with scat-

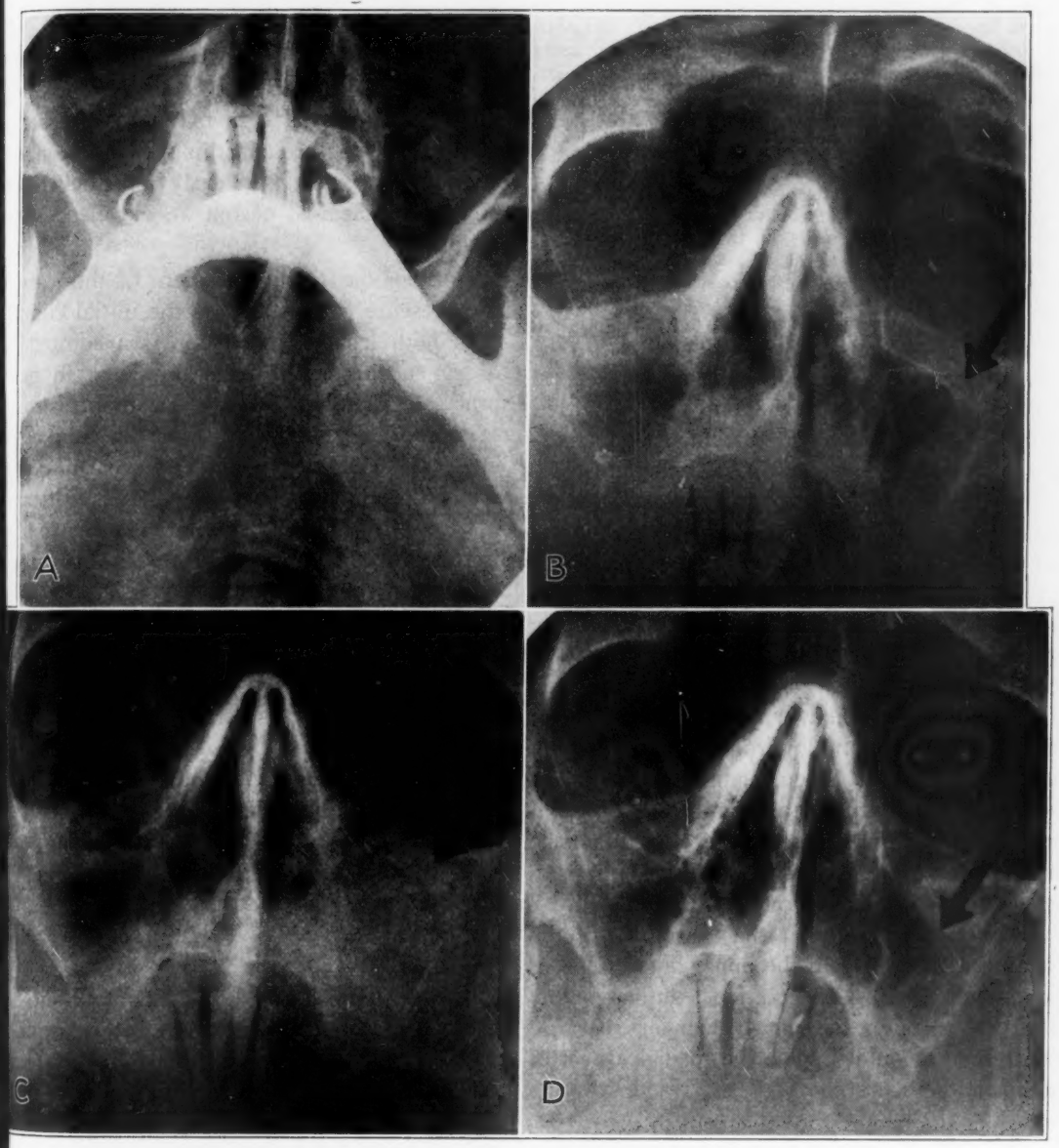


Fig. 2.—*A* and *B*, roentgenograms taken Jan. 18, 1941. The arrows indicate a well circumscribed tumefaction ing from the lateral wall of the left antrum.

C, roentgenogram taken May 23, 1941. The arrow indicates the left antrum filled with neoplastic tissue, which n as a polyp (figs. 2 and 3). The lateral wall of the sinus appears extremely thin.

D, roentgenogram taken February 28, 1942. Relatively good aeration of both maxillary sinuses may be seen. arrow indicates the left antrum, which was involved by the second neoplasm.

sing marrow spaces composed of loose fibrous con-ive tissue. In still other fragments groups of large were seen with distinct cytoplasmic borders, vesicu-nuclei and somewhat deep-staining cytoplasm. Scat-among these cells were numerous small round and tered bundles of striped muscle and nerve elements. The diagnosis was carcinoma.

Roentgen Therapy (Dr. L. Nathanson).—A total of 3,400 r was administered anteriorly and a total of 2,800 r laterally, a 6 cm. cone again being used. In addition to

this, a total of 2,000 r was administered through the right side, crossfiring the right and left maxillary sinuses. The factors employed were the same as those used on the right side.

Course.—The postoperative course was similar to that after the first operation and was completely uneventful. Because of a suspicion that this second neoplasm might be a metastasis of a hypernephroma, a complete renal work-up, including the making of an intravenous pyelogram, was performed, with negative findings. The patient has been seen at monthly intervals to the time of writing without any evidence of neoplasm being observed in either antrum or cervical metastasis. Roentgenograms were taken on Feb. 28, 1942 as a follow-up measure, and the report (Dr. L. Nathanson) reads as follows: "Study of the sinuses at this time shows relatively good aeration of both maxillary sinuses (fig. 2 *D*). There is considerably thickened membrane about the margins of the sinuses on both sides as one would expect. However, the walls of the sinuses appear to be intact, and there is no break that one could definitely demonstrate. This result has been an excellent and an unusual one."

COMMENT

This case bears analysis because of several unusual features. It is the only one reported during the past twenty years in which each maxillary antrum was invaded by a malignant neoplasm. No report of dual involvement, whether occurring simultaneously or at an interval, could be ascertained.

These tumefactions are unquestionably distinct entities, and not metastatic, since their pathologic pictures were different, as described in the foregoing section. Furthermore, there is no anatomic pathway, either vascular or lymphatic, to account for extension of the tumor from the right antrum to the left antrum. Then, again, spread of the neoplasm through the nasal chambers is obviated by any such finding. To further substantiate the premise that these tumors are distinct entities, a review of the roentgenograms shown in figure 2 *A* and *B* will reveal that the carcinoma of the left antrum begins from the upper lateral wall of the antrum. This observation eliminates any extension through the nasal chambers because such a route would involve the medial aspect of the left antrum first.

Besides the bilateral involvement of the maxillary antrums with neoplasm, the extraordinary phenomenon of a carcinoma developing in the left antrum right under one's nose bears mention. By means of the roentgenograms one can venture an estimate of the time elapsing from the inception of the growth until it filled the left antrum completely. Approximately six months elapsed before the growth began to extend beyond the bony confines of the antrum. It is during this period that a correct diagnosis results in a splendid recovery.

In retrospect, an earlier diagnosis should ha been obtained in the case of carcinoma of the antrum because of the shadow apparent on roentgenograms (fig. 2 *A* and *B*). At t time an opaque medium should have been instil into the sinus to determine the contour and extent of the tumor. If the roentgenogram t taken indicated a large growth with an irregu surface, a finding arousing suspicion of a ma nant growth, an exploratory antrotomy for bio purposes should then have been considered. F tunately, the initial sign of epistaxis associa with pain which brought this second lesion to attention was sufficiently early in the developm of the neoplasm to permit an excellent surg result.

Another outstanding element of this case the presence of epistaxis as the initial compl with both lesions. Epistaxis is a common order encountered by the physician in gen practice. In most instances his therapy cons of the use of a nasal pack or the cauteriza of Kiesselbach's area with the fervent prayer this procedure will prove adequate. Fortuna for the physician and the patient, this appro is successful in the majority of cases because pathologic condition present consists of an sion of a vessel in this region due to trau hypertension or local infection. Occasiona however, epistaxis is the harbinger of a clin entity which warrants a thorough investigatio so graphically exemplified in this case rep Cognizance of such possibilities in conside any patient with nosebleed will obviate ca therapeutic measures and stimulate painsta examination.

DIAGNOSIS AND THERAPY OF ANTRAL NEOPLASMS

Early diagnosis is synonymous with succes therapy of the neoplasm. The latter causes in the late stages. This maxim is applicable, to growths of the antrum of Highmore. Co quently, a facile diagnosis of an involvemen this region usually is indicative of a poor p nosis, for the lesion has become extensive. If is keen enough to make an early diagnosis, prognosis is invariably good; however, diagnosis of this ailment is surmounted with finite difficulty because it is practically sympt less. When the tumor mass is sufficiently l to cause a sense of fulness and to erode the wall of the antrum, with tumefaction of the tissues, pain is experienced. Because of th tensity of this symptom, the patient seeks a

d relief. The pain is caused by the tumor as it croaches on some of the nerve filaments. Frently, an incorrect diagnosis of neuralgia or douloureux is made. Consequently, one must fully aware of the possibility of neoplasm when nfronted by a patient with such an intractable mplaint.

Roentgen studies of the antrum which do not eal destruction of bone may show an alteration density that obliterates the air cavity, an city which may be due to neoplasm, polyposis, erplasia, exudate or any combination of these cesses. Although the roentgenograms can monstrate the extent of the involvement, they erally cannot define the pathologic entity with- supporting clinical and physical findings. The ior of the antrum may be complicated by a onic infection. Roentgen evidence of destruc- of bone often means an advanced stage of cer. The majority of antral neoplasms are covered accidentally at operations for sinusitis. Biopsy must be done in every instance, especialwhen there are atypical clinical and physical dings. A substantial amount of tissue for roscopic study must be obtained from an ning into the canine or the nasal fossa. If this lt is still not satisfactory and there is a strong ical suspicion, then a Caldwell-Luc procedure uld be done. Aspiration of tissue for microic study is an important procedure (Martin Ellis technic), but a negative report must be ired.

he surgical treatment of neoplastic diseases he antrum is universally supplemented by um and roentgen therapy. The present mode ttack consists of electrosurgical methods com- d with the use of radium and roentgen rays. t authors (e. g., Holmgren,[1] Green,[2] Quick,[3] ter,[4] Hesse,[5] Harmer,[6] Levesque and Gauducheau[7] Sharp,[8] Barnes,[9] Beck and Guttman,[10] New and Cabot,[11] Cook,[12] New,[13] del Regato,[14] Woodward and Archer,[15] Fenton,[16] Shutes[17] and Öhngren[18]) pursued this therapeutic approach with some modification of their own.

There are many instances in which an unsuspected malignant neoplasm was revealed at an operation done for chronic paranasal sinusitis. The surgical approach must be extended to meet such an exigency or an extensive involvement, as well as to provide easy access for the satisfactory adjustment of radium applicators. This extension of the operative field is usually supplemented with electrosurgical measures, since bulky neoplastic tissue can be readily removed with a radiotherm. The base is largely and often entirely bone, or it so closely approximates bone that electrocoagulation offers the most simple and efficient means of destroying the neoplasm. Additional treatment with radium and roentgen rays should destroy any tumor that may have infiltrated beyond the bony septums and may not be recognizable clinically. In some instances the surgeon takes every precaution to avoid destruction of bone by electrosurgical means in order to avoid a prolonged sloughing process. Such

Holmgren, G.: Erfahrungen über chirurgische dlung von malignen Oberkiefertumoren, Acta ryng. **7**:511, 1925.

Greene, D. C.: Carcinoma of the Antrum, Am. J. genol. **9**:591, 1922.

Quick, D.: Treatment of Malignant Growths sal Accessory Sinuses and Nasopharynx, Radi- **14**:191, 1930.

Richter, H.: Zur Klinik, pathologischen Anatomie herapie der bösartigen Geschwülste des Ohres der Luft- und Speisewege, Ztschr. f. Hals-, Nasenrenh. **31**:169, 1932.

Hesse: Zur Behandlung maligner Tumoren des Nasen-Ohrengebietes, Ztschr. f. Hals-, Nasen- u. eh. **31**:233, 1932.

Harmer, D.: The Relative Value of Radiotherapy Treatment of Cancers of the Upper Air Passages, M. J. **2**:910, 1931.

7. Levesque and Gauducheau, R.: Traitement radiochirurgical des tumeurs du massif maxillo-facial, Bull. Assoc. franç. p. l'étude du cancer **20**:669, 1931.

8. Sharp, G. S.: Carcinoma of Maxillary Antrum, Radiology **17**:984, 1931.

9. Barnes, H. A.: Malignant Tumors of Nasal Sinuses, Arch. Otolaryng. **6**:123 (Aug.) 1927.

10. Beck, J. C., and Guttman, M. R.: Malignant Diseases of the Nose and Nasal Accessory Sinuses, Ann. Otol., Rhin. & Laryng. **41**:1, 1932.

11. New, G. B., and Cabot, C. M.: The Curability of Malignant Tumors of the Upper Jaw and Antrum, Tr. Am. Laryng., Rhin. & Otol. Soc. **41**:584, 1935.

12. Cook, T. E.: The Surgery of the Malignancy of the Maxillary Antrum, Dallas M. J. **26**:130, 1940.

13. New, G. B.: Malignant Diseases of the Paranasal Sinuses, Am. J. Surg. **42**:170, 1938.

14. del Regato, J. A.: Sur la roentgenthérapie des épithéliomas du sinus maxillaire, Radiophys. et radiothérapie **3**:557, 1939.

15. Woodward, F. D., and Archer, V. W.: The Results of Treatment of Malignant Tumors of the Larynx, Hypopharynx, Nasopharynx and Sinuses, Virginia M. Monthly **67**:751, 1940.

16. Fenton, R. A.: Some Annoyances in the Management of Malignancies of the Accessory Sinuses, Ann. Otol., Rhin. & Laryng. **43**:39, 1934.

17. Shutes, M. H.: Cured Carcinoma of Nose and Antrum, Laryngoscope **44**:924, 1934.

18. Öhngren, L. G.: Malignant Tumors of the Maxillo-Ethmoidal Region: Clinical Study, with Special Reference to Treatment with Electrosurgery and Irradiation, Acta oto-laryng., 1933, supp. 19, p. 1.

conservative measures must be avoided, because the difference between success and failure for a reasonably early tumor is the adequacy of the electrosurgical treatment or the sufficiency of the dose of radiation or both. Combined irradiation and electrosurgical procedures are curative for certain types of early cancer but are generally only palliative for malignant tumors of extensive involvement.

The open surgical approach to the malignant neoplasm is still used in carefully selected patients, but there are many advocates for radical dissection. Resection of the upper jaw is a serious procedure with regard both to its immediate risks and to the subsequent disability. Carcinoma of the maxillary sinus shows relatively little tendency to metastasize, particularly while it is in the operable stage. Operability depends on whether the tumor can be completely extirpated. Anything short of complete removal or destruction of the growth is a failure, and a failure of this kind may be worse than no operation at all. If there appears to be a reasonable chance of cure, the patient should have the benefit of that chance. If there is any invasion of the orbital contents, the eye should be removed. Deep extension into the pterygopalatine fossa along the pharyngeal walls, or into the cribriform region, virtually precludes the possibility of a cure. Invasion through the anterior or the inferior walls, however, is not of itself incompatible with successful treatment. Postoperatively, owing to infection and sloughing, there is a profuse foul discharge which lasts several days. The discharge can be minimized by daily irrigations. When healing is complete, the maxillary defect can be bridged or filled with a dental appliance.

Instead of resection, most authorities on the subject usually employ a Caldwell-Luc approach for the development of avenues through which, following the removal of the tumor, accurate adjustments of radium applicators can be made. Electrosurgical treatment is not only an effectual method of exposing the antral tumors but a valuable procedure for their destruction and removal. The biterminal method (Krusen) is preferable to the monoterminal, because fibrosis is more extensive and the entire tumor can be coagulated and removed as an inert mass. The blood vessels and lymphatics in the surrounding tissues will be sealed by thrombosis, thus preventing hemorrhage and shock, as well as dissemination of malignant tumor cells. The removal of large, soft, bleeding, sloughing tumors is often accelerated by supplementing coagulation with removal by the radioknife. Infiltrating tumors of the h palate are destroyed by electrodesiccation or agulation. The orbit must be exposed in a sim manner if there is found to be contiguous in sion. If roentgen studies show widespread struction or infiltration of bone, radical elec surgical procedures will be of little value may serve only to precipitate a condition misery and suffering. Öhngren [18] recommen exenterating the ethmoid cells in all patients have extensive infiltration of the maxilla, e though the ethmoid region is apparently fre involvement.

Roentgen radiation should be employed be operation if a clinical or a microscopic diagn of cancer is established. The special advantag preoperative roentgen therapy is the possibi of obtaining marked regression of a highly c lar and malignant neoplasm. This permits an proach that may offer a better result with elec surgical measures because of better visualiza and less hemorrhage. The actual technic of ra tion therapy belongs to the province of radiologist, thus negating any further elabora here.

Treatment of Complications.—Radiation r tions are practically nil. When radium is in c approximation to bone, much burning, pain conjunctivitis may occur. Even the tongue the buccal mucosa may be affected so that t is considerable discomfort in eating and swal ing; this reaction, which develops about days after the treatment, subsides in appr mately two to three weeks.

Electrocoagulation involves considerable struction of bone, and the involved bone req from three to six months for complete de ment. The slough, odor and pain are somet marked. Osteomyelitis, septicemia, general emia and sometimes meningitis may develop

Carcinoma commonly extends by direct tiguous infiltration. Epidural abscess is a freq terminating complication. Metastasis to cer lymph nodes usually does not occur until except in cases of rapidly developing, h malignant neoplasm.

Hemorrhage is not so common after ele coagulation, but the possibility is great with invasion, and, for this reason, ligation of the ternal carotid artery must be considered.

Pulmonary complications, bronchopneum and notably abscess of the lung, are usual minal complications. The greatest danger i propensity of these tumors to extend to meninges and invade the cranium.

End Results.—The good results are in the ients whose tumors are treated in the early ges, when the involvement is so slight that n the diagnosis is based on an accidental find- at an operation for sinusitis. Extensive trosurgical destruction and irradiation may d forth a possible 75 to 100 per cent chance so-called clinical cure for this early cancer. re is abundant clinical evidence to expect a ible 35 per cent chance of a good end result an operable cancer of the antrum even with nsive involvement. There seems to be a sensus that radium and roentgen rays without electrosurgery are not adequate for cure except in an occasional case.

SUMMARY

Cancerous involvement of both maxillary antrums was observed in a patient 62 years old. The neoplasms were separate and distinct entities. The second growth developed while the patient was under observation. A review of the literature has failed to reveal any report of a similar case.

681 Ocean Avenue.

ATROPHIC RHINITIS AND OZENA

WILLIAM M. FITZHUGH JR., M.D., C.M., D.Sc. (MED.)
SAN FRANCISCO

The consensus is that ozena is a symptom of atrophic rhinitis. Although the two conditions are similar in many respects, yet ozena has a definite characteristic odor and may be present without marked atrophy of the nasal structures. The histories of these diseases are punctuated by a variety of therapies, each of which is based on some reasonable hypothesis. Every subsequent approach to treatment is at first proclaimed with hopeful promises, but so far the final analysis has resulted, for the most part, in a bitter disappointment.

It is the purpose of this paper to remind investigators that atrophic rhinitis and ozena usually will improve at first with any type of therapy that is employed. It is therefore absolutely important to use a control along with the medication in such a fashion that the human equation is eliminated. By this I mean that the containers should have no characteristic markings and that only a third person should have the key; in this way neither the doctor nor the patient will know whether the control or the substance investigated is being used. The control should be similar to the medication without containing the active principle. Another reason for the use of a control is that clinically the signs and symptoms of these diseases will diminish if the nasal passages are kept moderately clean. The literature is filled with symposia in which this axiom is not followed, and therefore the conclusions drawn are of little scientific value.

In all medical investigations, clinical improvement should be substantiated as much as possible with histologic study. The inner lining of the nose, however, is an exception to this rule because of normal variations in its mucous membrane. It has been shown that congenitally there may be extensions of squamous epithelium from the vestibule, in addition to islets of the same tissue. On the other hand, every attack of allergic rhinitis and coryza leaves its mark on the surface epithelium as well as on the deeper structures. The peculiar changes in the submucosa due to ozena and atrophic rhinitis are probably more important than those that occur in the ciliated epithelium; consequently when biopsy specimens are taken before and after medication from two or more areas, their st may lead to erroneous conclusions.

Little is known of the causes of atrophic r nitis and ozena, but there are certain charac istics as to which some investigators agree. instance, these diseases manifest themselves local pathologic conditions due to a const tional susceptibility and are revealed in cer lineages. On the other hand, one finds isol cases in which there is apparently no family tory. There have been several explanations, a as to the nature of this predisposition. The m recent attempt was one to show that there broadening of the nasal bones due to an ante pituitary diathesis; however, not all roentg grams have verified this hypothesis. For y it has been known that the cell bodies, as as certain areas of the mucous membrane, h a definite relationship to the genitalia; atrophic rhinitis does not respond to the s medication as atrophy within the vaginal t Many attempts have been made to find etiologic organism, so far without success; same bacteria are found in the nasal secretio health as in that of atrophic rhinitis and oz The retrogression of the epithelium and of underlying structures has been attributed change in the circulation; whether this is to degeneration of the sphenopalatine gang or to a direct effect on the vessel walls is problematic. Purulent sinusitis with ma exudate has been cited as a causative factor degeneration of the intranasal tissues, but t are many patients with comparative gross pa logic appearances who have no history of s sitis. One also sees today relatively c healthy nasal deformities that are due to ra surgical treatment. It is now recognized atrophic rhinitis and ozena affect the same ber in both sexes but that women, becaus the symptoms, are more likely to seek cli relief. Although these diseases are more quent in adolescents, yet their occurrenc infants, as well as in persons in the fifth de of life, has been reported. Whether they their course and the symptoms become less s is also controversial; it is possible that th tients after trying many different types of

finally become more philosophic about their ndition. The explanation as to why the inci- nce of these diseases has diminished is still the realm of speculation; improved diet, hy- ne and sanitation, or early removal of infected nsils and adenoids may be among the factors sponsible.

As in all medicine, there are two therapeutic proaches to the solution of every problem. In days of the surgical panacea, various opera- ns were performed to narrow the nasal ity. The risks involved were far greater than benefits received, and although the results re fair, they had no effect in improving either condition or the function of the nose, but de it extremely difficult to keep the nares free m scabs. The main hazard is the possibility involving the sinuses, as well as causing an cerbation of the original disease, so that now st rhinologists have eliminated radical opera- n in the treatment of these conditions. If rked sinusitis already complicates the picture, is considered wiser to be conservative and ct the most simple operative procedure for promotion of drainage.

The etiologic explanation of atrophic rhinitis ozena is still obscure, and today the most cessful therapeutic approach is in the systemic the topical application of various remedies. first these pathologic conditions were con- ered to be of bacterial origin, but the unsatis- tory results of the parenteral administration different vaccines and foreign proteins, as as the inability to isolate the effective organ- s, have proved discouraging.

Long before the resort to surgery fell into repute, compounds containing iodine were pre- bed for oral use with the purpose of stimulat- the secretion of mucus but it was soon recog- d that, provided the nares were kept free of sts, the topical application was more efficient. day, this is true of all drugs, including iodine parations. The most important measure is ing the nasal passages clean; the employ- t of various irritating drugs for the produc- of local hyperemia is only of secondary ificance. Evidently the consensus is that in stages of atrophic rhinitis and ozena the mal mucous membrane is completely de- yed, as recent reports of results have failed ention the effect which these remedies may on ciliary activity. Whether the lethal on produced by these drugs is important is her matter, for I am quite sure that in many ances they will destroy any nasal ciliated elium which is left. In fact, ordinary saline tions which are not isotonic will produce slight to moderate congestion along with intra- cellular changes. It should also be mentioned that oily solvents are sometimes soothing but will mechanically hinder the delicate cilia from functioning properly. On the other hand many solvents used may cause an unfavorable reaction if they are accidentally aspirated into the lower respiratory tract.

At first estrogen and androgen were consid- ered completely effective, but later it was found that any benefits rendered were due to their local irritative effect. Unpublished investigations in which estrone (theelin) in oil was used, and a control with the oil alone, showed no appreci- able difference in the ultimate results. The explanation as to why estrogen causes physiologic hyperemia in the nares, if any, is that this is due to the production of acetylcholine. The latest work has shown that better results may be obtained if 0.25 cc. of a 1:2,000 solution of neostigmine (Prostigmine) methlysulfate U. S. P. is sprayed into a clean nose four times a day, which still further inhibits the acetyl choline esterase. I have modified this treatment by com- bining the same strength of neostigmine methyl- sulfate with aluminum hydroxide gel U. S. P. as a solvent. The latter combination has been found to be efficacious in diminishing the crusts and thereby eliminating the necessity of frequent douching.

A NEW CONCEPTION

There is another modus operandi to the treat- ment of these diseases which in the past has been sadly neglected by the otolaryngologist. This approach, however, has been rendered pos- sible only in the last generation by the advances made in cancer research. Today, scientists be- lieve that the proliferation of embryonic cells, characteristic of all neoplasms, is due to a funda- mental disturbance in the biochemical reaction of tissue metabolism. This hypothesis is estab- lished on a firm scientific foundation by efforts to determine what compounds are present for the purpose of promoting normal growth and then to determine whether their absence or their perversion is responsible for certain pathologic abnormalities. Research has shown that a high concentration of the sulfhydryl (thio) radical (—SH) is found in regions of mitosis, and therefore it has been accepted that substances containing this group are essential for cell divi- sion. The sulfhydryl radical is extremely labile, which is natural if it plays an important part in proliferation; after oxidation it may be re- sponsible for the inhibition of hyperplasia. This has been corroborated by recent investigations, which have drawn attention to the fact that mi-

crobiotic agents which have antibacterial activity (e. g., gramicidin and penicillin) contain a fundamental sulfhydryl group as part of their molecule.

In a previously published investigation [1] I found that parathiocresol applied topically to the nasal mucosa in the absence of a purulent exudate gives marked relief from the symptoms of atrophic rhinitis and ozena. In experimental work it was observed that this remedy (1:1,000 strength) stimulated the activity of the cilia of the mucosa of a frog's esophagus. As has been said before, any treatment of these pathologic conditions if preceded by cleansing of the nares is bound to be followed by improvement. However, in my previous report it was stated that, of 16 patients, 11 showed decided improvement; 4 of these were completely cured (described in detail in the article referred to); of an additional 30 patients, 25 showed marked diminution of symptoms, with 6 exhibiting complete cures. It is not my purpose in the present paper to discuss this therapy further except to point out that the results were, I believe, better than those obtained from current methods of treatment, and I feel that it would be well worth while to make further investigations either with parathiocresol or some other drug that is beneficial for cell maturation and cell growth.

COMMENT

Physicians are, apparently, no closer to solving the problems of the causation and the treatment of atrophic rhinitis and ozena than they were thirty years ago. This does not mean that there is a scarcity of literary effort, but one soon realizes that a great many hypotheses have been eliminated through "trial and error" manifested mainly by ineffectual therapy. These diseases appear to lack the stimulus of interest for research which surrounds the study of cancer, the reason being that, although most of the aff are miserable, on the other hand the path process is never fatal, and consequently money is spent, nor is it considered worth to spend years of contemplative study, i solution of these problems.

Probably the secret of atrophy is closel lated to neoplastic proliferation—after all degeneration is the reverse of maturatio believe that the secret of atrophic rhiniti ozena lies in the explanation of cellular me lism.

SUMMARY

It is hoped that this general discussi atrophic rhinitis may motivate further in gation with growth-stimulating substances.

Ozena still could be a separate disease atrophic rhinitis.

Neither disease has any predilection fo race or sex.

There is an immediate improvement i nares are kept clean.

So far surgical maneuvers to narrow the passages or to sever the nerves have p to be of little benefit.

At first the transitory congestion produc topical applications of drugs, which, acti a foreign body, are irritating, diminishe symptoms.

So little is known of the pathologic ch that through "trial and error" many drugs been used without lasting effect.

In this article certain suggestions have made as to the approach and the meth future investigations.[2]

384 Post Street.

1. Fitzhugh, W. M., Jr.: The Effect of Sulphydryl Compounds in Oto-Laryngology, Laryngoscope **48**:884-903 (Dec.) 1938.

2. I wish to apologize for not mentioning tho ticles which have contributed most to present k edge of these diseases. I believe that it would been of value in a paper of this kind to incl complete bibliography. However, the paper sh will not permit its publication. A mimeograph of articles published in the last twenty-eight yea been prepared and will be sent to any one wh may interest.

OCCUPATIONAL DEAFNESS

WITH SPECIAL REFERENCE TO CHRONIC OCCUPATIONAL DEAFNESS

ABRAHAM GOLDNER, M.D.
NEW YORK

e extent of occupational impairment of ng is little realized inasmuch as its begin- are a slight impairment of hearing for frequencies of the tone range not used in ary speech. The cochlear end organ is a te mechanism highly susceptible to chem- oisons and strong auditory stimuli. When methods are used in otologic investigation ges in the organ of hearing can be detected before noxious influences make themselves rent in other parts of the body.

CLASSIFICATION

ses of occupational deafness may be classi- grossly as (1) those in which deafness is to noise or explosive sound, (2) those in h it is caused by poisons and chemical agents, those in which it is due to changes in metric pressure and (4) those in which it ts from trauma.

afness Due to Noise and Explosive Sounds. he occupational deafness of this group may urther subdivided into (*a*) acute and (*b*) nic.

a) Acute Type: Acute occupational deafness to noise makes a dramatic appearance and elf evident. The group includes cases of ness due to gunshot and other explosive es of extreme intensity. In this group it fficult to separate the effects of concussion n those of intensity of sound.

b) Chronic Type: From the standpoint of nt, importance and unsolved problems, this p is of most concern to the medical profes- industry and labor. The deafness is in- ous in onset and the intensity of the noise is w the level of painful stimulation.

Deafness Due to Poisons and Chemicals.— t quinine, lead, tobacco and arsenic may cause airment of hearing is fairly well known. That y other chemicals, such as phosphorus, car- disulfide, paraphenylene dyes and others, cause cochlear degeneration is not as well wn. However, numerous experiments by Lurie and others [1] have shown that the delicate sensory hair cells of the organ of Corti respond to noxious chemicals in almost the same manner as they do to sounds of high intensities.

Deafness Due to Changes in Barometric Pressure.—In this group are included (*a*) deafness in aviators following ascent and descent and (*b*) deafness of caisson workers.

(*a*) Deafness of Aviators: This deafness is a mixed type. The effect of pressure changes is to produce a recurrent aero-otitis media, which has been well described by Campbell and Hargreave.[2] The effect of noise of high intensity coexists in this condition frequently.

(*b*) Deafness of Caisson Workers: Among caisson workers the effect of changes in pressure on hearing is an embolic effect of bubbles of nitrogen released incident to rapid decompression.

Traumatic Deafness.—This type of deafness should not be included in a strict delimitation of occupational deafness inasmuch as the trauma is not of occupational origin. However, in the past, writers have indiscriminately included cases of this type in discussions of occupational deafness and they are encountered frequently in connection with claims of compensation. The work of Brunner,[3] Grove [4] and others has conclusively demonstrated that trauma of the skull of any variety may produce changes in hearing or in equilibrium.

---

1. (*a*) Lurie, M. H.: What Is Perception Deafness from Physiologic and Experimental Basis? Ann. Otol., Rhin. & Laryng. **48**:3 (Nov.) 1939. (*b*) Taylor, H.: Deafness from Drugs and Chemical Poisons, in Fowler, E. P., Jr.: Medicine of the Ear, New York, Thos. Nelson & Sons, 1939, p. 339. (*c*) Bunch, C. C.: Traumatic Deafness, in Fowler, p. 349.

2. Campbell, P. A., and Hargreave, I. J.: Acute and Chronic Aviation Deafness, Arch. Otolaryng. **32**: 417 (Sept.) 1940.

3. Brunner, H.: Pathologie und Klinik der Erkrankungen des Innenohres nach stumpfen Schädeltraumen, Monatschr. f. Ohrenh. **59**:697, 1925.

4. Grove, W. E.: Otologic Observations in Trauma of Head, Arch. Otolaryng. **8**:249 (Sept.) 1928.

CHRONIC OCCUPATIONAL DEAFNESS

While the whole field of occupational deafness needs correlation and further study from an industrial standpoint, chronic acoustic occupational deafness is the most important and will be more thoroughly discussed.

The literature is replete with scattered articles in which deafness is described as a result of occupation. Bunch [5] was one of the first American writers to describe the observations of Fosbroke, who in 1831 gave a lucid description of deafness in blacksmiths caused by contusions and noises in the inner ears. From that time on, there were spasmodic observations of this condition, reaching their climax at the turn of the century with the pioneer experimental work of Wittmaack,[6] who was one of the first to demonstrate in laboratory animals that sounds of high intensity can injure the cochlea. At this time scores of investigators started to probe this subject and reported many cases of deafness in an assortment of occupations. Unfortunately, the physics of sound was then little understood, and as yet there was no efficient instrument for the measurement of sound. Since that time, with the great strides made in otologic research by the American school, physicians have learned more about the actual mechanism of hearing and now are able to apply this knowledge to the subject of deafness arising from occupations.

ACOUSTICS

It is to the physicist and the acoustical engineer that the otologist must turn for clarification of the basic nature of sound. While the whole field is important and vital, for the physician it is most important that he know the derivation of basic sound measurements and also what means exist to measure sound.

Sound energy can be expressed as microwatts, dynes per square centimeter or more commonly in decibels. There are definite mathematical formulas which express these relationships accurately. A working definition of the decibel would be that it is the smallest unit of sound perceived. Between the threshold of feeling and the threshold of pain of a sound of a definite cycle there is a range of about 130 decibels. Most human beings can perceive sounds of the nature of 20 to 20,000 cycles per second, but only the frequencies up to 2,048 or lower make up the usual speech range, with bulk of the intelligible range in the neighborh of 1,000 cycles. The basic decibel unit as in this country has been obtained by ac measurement of normal groups of person their response to a tone of 1,000 cycles second, so that when an industrial noise or other noise is said to have a value of 50 deci it should be understood that it is being c pared with an intensity of a tone of 1,000 cy Such a measurement has obvious disadvanta but it has provided otologists with their means of measuring and standardizing n levels so that different studies can be correl and definite thresholds set.

There are several methods of measu noise. The earliest was that of Barkhau (quoted by Causee [7]), who used a tuning of 800 cycles and either compared or attem to mask out the sound that was being measu

The method more commonly used is the jective method whereby an instrument kn as the audiometer or decibel meter is used. no subjective element enters. The sound is into a series of electrical circuits made to semble as much as possible the human ear effect, and the energy is then converted decibels. With this method it is also poss to filter out various frequencies and thus mea the intensities of the various components make up a given noise.

The last method is that of graphic portra used in sound movies and such processes which the sound waves making up a given so are actually portrayed by means of a cath oscillographic tube. All these methods are v able and should help materially to elucidate problems of noise.

PHYSIOPATHOLOGY

The pathogenesis of occupational deafnes learned in research as to the mechanism hearing. Wittmaack [6] was one of the first demonstrate that loud tones may produce les in the organ of hearing. His experiments observations were duplicated on many occasi and it was definitely proved that sounds of g intensity, particularly high tones, will pro various lesions in the organ of Corti, resul in degenerative changes in the sensory eleme which are accompanied by secondary degen tion of the peripheral neuron. With the velopment of more accurate methods of rese in this country it was demonstrated by Lur

5. Bunch, C. C.: The Diagnosis of Occupational or Traumatic Deafness, Laryngoscope **47**:615 (Sept.) 1937.

6. Proceedings of the Third International Congress of Occupational Disease (not available).

7. Causee, R.: Industrial Noise, in Occupation Health, Geneva, International Labour Office, Septe 1938.

ild and others, that it is the external hair ls of the organ of Corti which are more sus- tible to trauma. It was also noted that the st region to be involved was the basal whorl the cochlea, from which the perception of h tones originates. It is thus easy to under- nd why deafness among workers is so insidi- s in its development and not detected by the al methods until after many years, for the rliest manifestation of impairment is among high frequencies, which are not concerned th speech.

Similarly, anatomic examinations of the ears workers with industrial deafness made by bermann,[6] Bruhl[6] and others have shown generative changes in the organ of Corti. wever, their observations are open to ques- n, as in the age groups investigated arterio- erosis might present a similar picture.

Damage to the vestibular portion of the laby- th by noise has never been demonstrated by erimental or clinical methods. This fact is portant in differential diagnosis.

Similarly, the integrity of the eustachian tube d the middle ear has never been definitely wn to be impaired. This is important, for tympanic membrane, the window of the ddle ear, is most susceptible to clinical exam- tion, and similarly the patency of the eusta- an tube can be readily demonstrated.

One practical result of experimental studies hearing is useful in the selection of workers noisy occupations. It has been shown that jects with well defined conductive deafness not exhibit a reaction of fatigue when ex- ed to intense prolonged high tones. Normal sons and those with perceptive deafness do hibit a reaction of fatigue, manifested by a ering of the auditory response. This seems indicate that people proved to have conductive iness would be less affected by noisy occu- tions, and that, other things being equal, there uld be less risk in their being employed in s type of work. Thus it is possible to solve problem of economic rehabilitation of these ened people and at the same time reduce hazard to other workers.

Other recent items of research have shown t an intact ossicular chain in muscular balance one of nature's most effective protections inst the effects of intense noise. From this t it can be readily deduced that workers who e lost one or more of these ossicles as a result chronic purulent otitis media would, because the auditory risk, be poor selectees for noisy upations. This and the foregoing findings e been confirmed by clinical observations of many reliable investigators, and it is to be hoped that additional work will further clarify these problems.

NOISY OCCUPATIONS

In this rapidly expanding machine age, excessive noise seems to march along with progress. To enumerate all the processes and occupations which are noisy would be cumbersome and unnecessary. However, a basic conception is necessary in evaluating the noise of any occupation. Another factor is vibration, which still requires additional investigation. It is not possible to state accurately what decibel level of noise is the minimum which may produce changes in man. Not only intensity, but frequency, periodicity, length of exposure and individual variations must be taken into account. A consensus seems to indicate that the minimum safe level is in the neighborhood of 80 decibels and that an exposure of at least two years is necessary to produce changes at this level. It is quite probable that with more accurate surveys in the future, this level may be revised downward as early minimal changes are detected on the audiogram. In a general way, the following occupations can be classified as noisy—as those in which workers are prone to have deafness after varying periods of exposure.

1. Metal industries. All the various processes attendant on the fabrication and the shaping of metal are among the prime offenders. The earliest recorded case of occupational deafness belongs to this group.

2. Pneumatic tool employments. In this group the effect of noise has not as yet been disassociated from the effect of vibration, but as the intensity of noise is excessive, this fact is of little moment.

3. Spinning and weaving. Peyser,[6] Ropke,[6] Beck[6] and Holtzman[6] (quoted by Causee[7]) showed that there was a high degree of deafness among workers engaged in spinning and weaving and that the highest proportion occurred where the intensity of the noise was highest.

4. Transportation employments. Studies by Martinet,[6] Hedinger,[6] Burkner,[6] Sachs,[6] Passow[6] and others of the German railway system have indicated for many years that diseases of the ear were frequent among the employees of this transportation system.

5. Aviation and other employments connected with the transportation end of the aviation industry. In this group one encounters also the effects of changes of barometric pressure.

6. Switchboard operation. This group is mentioned only because of the reams of paper

that have accumulated as to the increased incidence of deafness among telephone operators. However, recent studies indicate that deafness occurs only in those operators who have been exposed to sudden shocks or loud noises.

The preceding classification represents grossly only a few of the many industrial activities surrounded by excessive noise. The simple test that can be applied to any process is the occurrence of noise that has been shown to be harmful to the hearing of workers.

THE DIAGNOSIS OF CHRONIC OCCUPATIONAL DEAFNESS

The correct diagnosis of occupational deafness becomes especially important as cases are brought before compensation boards for adjudication. While the exact number of such claims brought before the department of labor of the state of New York is not known, there is good reason to believe that it is considerable. The evaluation of a case of deafness from an occupational point of view can be grossly divided into three stages: (1) the evaluation of the industrial environment, (2) the determination of the nature of the deafness as indicated in the history and the examination of the worker and (3) the differential diagnosis.

Evaluation of the Industrial Environment.—The ideal manner would be to measure the noise by means of any of several instruments available. From this figure it would be possible to compute the total exposure in terms of years. The character of the noise, its frequency and its rhythm are also important. Reference should also be made to any authenticated studies of similar groups of workers.

History and Examination of the Worker.—The value of a subjective history, particularly with respect to claims, is diminished by a tendency of claimants to fail to mention essential data. However, there are certain important points to be stressed. These are the exact time of onset, the length of exposure, a history of trauma to the head, infectious diseases, a familial history of deafness, frequent colds, a history of syphilis and exposure to drugs, poisons or chemicals. It is sometimes necessary to supplement this history by a social investigation to bring out whether the claimant was ever treated for deafness in hospitals or whether any loss of hearing in the claimant was noticed by neighbors before his employment.

The examination of the worker should include besides the general examination a thorough examination of the ear, the nose and the throat. The tympanic membrane should examined minutely, with particular emphasis its texture and the presence or the abse of healed perforations. The patency of eustachian tube should be determined, and reactions of the equilibratory apparatus are p ticularly important. Hearing should be exa ined by gross methods and minutely by mea of an approved audiometer, in a soundproof ro if possible. When all the findings are ava able, it is possible to proceed with the differe tial diagnosis.

Differential Diagnosis.—In the uncomplica case of chronic occupational deafness the fi ings are as follows:

1. The impairment is usually bilateral, unless one has been exposed exclusively.
2. The subject is usually middle aged or older, un exposure has been extreme.
3. The tympanic membrane is normal.
4. Bone conduction is diminished in relation to conduction, indicated in otologic terms as a posi Rinne test and a positive Schwabach test.
5. Diminution of hearing for high tones is eviden by the audiograms of patients with occupati deafness as shown by Bunch.
6. The vestibular responses are normal.
7. The eustachian tubes are patent.

A worker in a noisy industry for whom findings listed have been made would be p sumed to be suffering from occupational de ness unless another type can be shown to ex Chronic otitis media and chronic catarrhal de ness are easily differentiated by the results local examination and the history. The p forations and the purulent discharge of purul otitis media are characteristic, and the retract thickened tympanic membrane of the pati with chronic catarrhal deafness, together w characteristic disturbances in the patency of eustachian tube, should make differentiation re tively simple. Difficult conditions to differenti would be those of perceptive deafness such occurs with cranial neoplasm, arteriosclero cranial trauma, toxemia and infectious disea The history will be important, and in many these other conditions the labyrinth is a affected, which indicates the importance of la rinthine studies in these cases.

In brief, the criteria of occupational deafn are rather fixed, and within these criteria fairly accurate differential diagnosis is possi

CHRONIC ACOUSTIC OCCUPATIONAL DEAFNE AND COEXISTENT DISEASE OF THE EAR OF SOME OTHER TYPE

That chronic acoustic occupational deafn may coexist with some other type of a

ase is self evident. The problem of deter-ing how much damage of the hearing is to the accompanying pathologic process and much is due to industrial noise is a dif-lt one, and each case would have to be ded individually. At this point it would valuable to repeat that noise is apt to be e harmful to workers suffering from purulent is media or perceptive deafness and apt to less harmful to workers with preexistent nic conduction deafness.

PREVENTION OF CHRONIC ACOUSTIC OCCUPATIONAL DEAFNESS

he obvious solution of the problem of pre-tion would be to reduce noise at its source.[8] e acoustic engineer is well fitted to solve problems of reducing noise and vibration w those levels which are known to cause terious effects. Soundproofing, various types foundations, size of room and amount of hinery in the room are a few of the factors must be taken into consideration.

toppers and similar pieces of apparatus for protection of workers' ears are far from factory. Apart from the fact that such ns are ineffective, most workers are reluctant ubmit to any effective dampening of normal ing impulses. In some industries it would hazardous to reduce the workers' hearing hese means. It may be possible to develop ound filter which would filter out harmful d intensities and still allow perception of h frequencies, and this would perhaps meet popular approval.

nother valuable procedure is the proper tion of workers. In industries known to noisy it is important to examine the ears rospective workers properly. Those with eptive deafness or with purulent otitis media ld be "poor risks." Those with chronic rrhal deafness of an uncomplicated type would to be "good risks." Careful evaluation of aural condition of such persons and of r employment and frequent reexamination their hearing would be most valuable and ld help to shed light on this important sub-. It is also important to make periodic iometric examinations of the hearing of work-ers exposed to intense noises, so that early involvement of the hearing for high tones may be detected and the victims removed from the noisy environment.

In conclusion, it can readily be understood that occupational deafness is an important phase of industrial hygiene. It is to be hoped that in the future the surveys of noise and its effects in industries will be more adequate and thorough, they should be supervised, if possible, by a team made up of an acoustical engineer and an otologist with a knowledge of industrial hygiene, so that more efficient efforts may be made to reduce this serious hazard.

SUMMARY

Cases of industrial deafness may be classified into four groups: those in which the condition is due to exposure to acute or chronic noises, those in which it is caused by chemical agents, those in which it is due to changes in pressure and finally those in which it results from trauma.

The etiology of industrial deafness is on a sound pathologic and physiologic basis. The most important findings are degenerative changes in the outer hair cells of the organ of Corti, starting in the basal whorl of the cochlea.

The diagnosis of chronic acoustic occupational deafness is based on a history of exposure to noise capable of producing injury to the organ of hearing; a normal ear drum; an elevated threshold for high tones, as manifested on the audiogram and with tuning forks or tests with Galton's whistle; diminished bone conduction, as shown by a positive Rinne and a positive Schwabach test; normal vestibular responses; patent eustachian tubes; differentiation from other lesions capable of producing a similar clinical picture.

Certain selected persons with chronic catarrhal deafness, on the basis of their fatigue reactions, may be less susceptible to the harmful effects of exposure to noise.

The present mechanical ear protectors are not efficient nor are they practical; the cooperation of an acoustical engineer is necessary to control noise at the source. Preemployment and periodic examinations of the hearing of workers exposed to noise would be of great value in minimizing the problem.

80 Centre Street.

Bartlett, F. C.: The Problem of Noise, London, bridge University Press, 1934.

NONVIRULENT DIPHTHERIA

GORDON F. HARKNESS, M.D.
DAVENPORT, IOWA

To epitomize relative to the causative organism in diphtheria, according to the modern nomenclature of bacteria, the first genus in the first family in the second order of bacteria is known as Corynebacterium diphtheriae (Lehmann and Neumann [1]). The organisms are slender, at times slightly curved rods with a tendency toward club and pointer forms. There is barred and uneven staining. The organisms are gram positive, aerobic and nonmotile. They are nonspore-producing and often show metachromatic granules. The genus divides itself into the true diphtheric organism and those of the so-called diphtheroid group. To evaluate the distinction between the two species it is necessary to review briefly the facts about the true organism and its relation to clinical diphtheria.

Toxigenicity is concerned with the ability of the organism to produce toxins and virulency has to do with the behavior of the bacilli toward living tissue.

Serologic differentiation of the true organism has been attempted, and five types have been demonstrated, with different fermenting powers.

Of more practical importance, Anderson, Happold, McLeod and Thomson [2] with special mediums established three main groups distinguished by colony forms, with some antigenic and toxic differences. These forms are known as mitis, intermediate and gravis.

There has also been an attempt to classify the organisms morphologically as to staining characteristics: smooth, typical and atypical; barred, typical and atypical; granular, typical and atypical, and involution forms, typical and atypical. The morphologic characteristics of the organisms will give to the skilled observer a hint as to probable virulency, but are not conclusive. The so-called bulging type of bacte is by some considered indicative of virulenc

The mitis, intermediate and gravis forms probably variants of the same organism s they produce identical toxins and the clin severity does not always depend on the typ organism.

No ravages of a dread disease have been mitigated as have those of clinical diphtheria a specific therapeutic agent, antitoxin. Equ successful has been prophylactic immuniza carried out following use of the Schick test troduced by Park [3] (1915) in New York toxin-antitoxin; then by Ramon [3] (1923) the formaldehyde-treated toxin, which lesse the toxicity but not the antigenicity, and fi by Glenny (1935) [3] with the alum-precipita toxoid, more concentrated and somewhat p fied, and with a better antigen.

The problem of the carrier remains the m important epidemiologic feature of the dise Convalescents are usually spontaneously fre the bacilli in two or three weeks; exposed hea persons may become temporary carriers fo few days, but a small proportion become remain chronic carriers. The detection of riers is easily accomplished. The appearanc the mucous membrane may be entirely nor In the chronic carrier of virulent organis entirely saprophytic to the subject, the na geal tonsil is so often the host that tonsillect is routinely recommended.

Were this all of the problem, there would no question as to the necessity of quarantine its resulting inconveniences and often econo losses. But such is not the case. The sec species of Corynebacterium diphtheriae incl a large heterogeneous group of organisms wh have similar cultural and morphologic charac istics but which generally are saprophy harmless to human and animal bodies. "Bergey's Manual of Determinative Bacte ogy" [4] this diphtheroid species is divided

---

Read at the meeting of the Middle Section of the American Laryngological, Rhinological and Otological Society, Indianapolis, Jan. 17, 1945.

1. Lehmann, K. B., and Neumann, R., cited by Bergey and others.[4]

2. Anderson, J. S.; Happold, F. C.; McLeod, J. W., and Thomson, J. G.: Existence of Two Forms, B. Diphtheriae Gravis and B. Diphtheriae Mitis: New Medium for Their Differentiation and for Bacteriological Diagnosis of Diphtheria, J. Path. & Bact. **34**:667 (Sept.) 1931.

3. Cited by Zinsser, H., and Bayne-Jones, S.: Textbook of Bacteriology, ed. 8, New York, D. A ton-Century Company, Inc., 1939, p. 429-430.

4. Bergey, D. H., and others: Bergey's Manu Determinative Bacteriology, ed. 5, Baltimore, Will & Wilkins Company, 1939, p. 792.

en groups with twenty-one differently identi- bacteria. Bacillus xerosis is among them; resembles the bacillus of diphtheria very sely, having similar cultural characteristics, it differs in its fermentative action with some the sugars.

Some of the diphtheroid bacilli have their bitat in other animals than man and, as such, vary in their pathogenicity for animals. obably the most common or at least best own is the bacillus of Hoffmann, one entirely ocuous to laboratory animals and to man, ich forms no toxins; in animals immunized inst it no increased resistance to the true illus diphtheriae develops. It is frequently nd in normal throats.

The one common property of all the types of virulent organism is the production of a in neutralizable by an antitoxin.

The practical importance of the problem lies the incidence of the nonvirulent forms of diphtheriae. Anderson, Goldberger and chtel [5] studied 4,039 healthy persons in roit; 0.928 per cent harbored organisms tical morphologically with C. diphtheriae. 19 cultures made, only 2 were virulent. C. ffmann II was present in 41.9 per cent of 0 people. Again, in another group of cul- s in which the growth was identified as that Hoffmann's bacillus, only 47 per cent were ulent.

The real crux of the problem is the relation- between the virulent and the avirulent types. an [6] reported that he had succeeded in isolat- avirulent variants from a pure culture of a lent strain. Okell,[7] using the same strains a large number of mediums, was not able ubstantiate this report. Eagleton and Baxter [8] roached the problem from a serologic group- Okell and Baxter,[7] using the same ms, attempted to classify the avirulent forms concluded that the avirulent group were genically heterogeneous and bore little rela- to the virulent group.

While virulent and avirulent bacilli of this us may have similar morphologic and fermentative properties, bacteriologists now agree that avirulent bacilli can never become virulent in vivo or in vitro. Crowell [9] stated that no virulent strain can be caused to become avirulent by laboratory methods. It is true that both forms may coexist or that the avirulent form may follow the virulent in the same patient, or both may coexist in an epidemic. There is no evidence that avirulent diphtheria is even potentially a cause of toxic diphtheria or that avirulent bacteria can engender virulent variants.

Quoting Park,[10] "non-toxic diphtheria-like organisms retain their characteristics under various artificial and natural conditions and they may be regarded from a public health standpoint as harmless." This is of economic importance. A practical differentiation is a prime necessity. Electrophoretic potential differences have been studied and are of scientific interest but lack practical application.

Physicians have one practical test. It was emphasized by Loeffler [11] years ago. It is the distinguishing of the true virulent diphtheria bacillus from the pseudodiphtheria bacillus by the guinea pig virulency test.

Just as a carrier may harbor virulent organisms without visible changes in the mucous membrane, so may a carrier harbor diphtheroids without any clinical signs. During the past year I have encountered 4 persons who exemplify this: (1) a healthy child picked in a routine school examination; (2) a man with slight pharyngitis; (3) a man with no clinical symptoms, and (4) a child who five years before had been excluded from school as a carrier, was lost sight of and then for the second time was found in routine school examination. All 4 harbored nonvirulent types. There were also types of the nonclinical avirulent diphtheria.

However, I wish to call attention to a clinical entity. In searching the literature for the past ten years, with a bibliography of approximately one hundred titles, I find no mention of what has seemed to me to be a striking clinical picture.

Anderson, Goldberger and Hochtel, cited by Zins- H., and Bayne-Jones, S.: A Textbook of Bacteri- , ed. 8, New York, D. Appleton-Century Company, 1939, p. 426.

Cowan, M. L.: Separation of Virulent Cultures Diphtheriae into Virulent and Avirulent Types, J. Exper. Path. **8**:6 (Feb.) 1927.

Okell, C. C.: Relationship of Virulent to Avirus Diphtheria Bacilli, J. Hyg. **29**:309 (Dec.) 1929.

Eagleton, A. J., and Baxter, E. M.: Serological sification of Bacillus Diphtheriae, J. Hyg. **22**:107) 1923.

9. Crowell, M. J.: Morphological and Physiological Variations in Descendants of Single Diphtheria Bacillus, J. Bact. **11**:65 (Jan.) 1926.

10. Park, cited by Willett, J. C.; Nagle, N., and Pfau, C. L.: The Bacteriological Diagnosis of Diphtheria: The Relation Between Morphology and Virulence of the Corynebacterium, J. Missouri M. A. **30**:31 (Jan.) 1933.

11. Loeffler, cited by Jensen, L. B., and Falk, I. S.: Electrophoresis of Diphtheria Bacilli: Some Relations Between the Virulence, Toxigenicity and Electrophoretic Mobilities of Diphtheria Bacilli, J. Bact. **15**:367 (June) 1928.

REPORT OF CASES

CASE 1.—Miss C., aged 23, a school teacher, had noticed slight hoarseness for a month. Otherwise her health was normal, and there were no other complaints. There was no fever. Serologic tests gave negative results. There was no soreness of the throat. Four years before this she was immunized against diphtheria, and two years later, when given the Schick test, she had a positive reaction. Examination revealed nothing except that in the subglottic region there was marked crusting of the mucous membrane. This could be seen only with inspiration during the laryngeal examination. Swab, smear and culture of material from the subglottic region gave only a diphtheroid bacillus. The pharynx and the tonsils showed nothing abnormal. She was given 20,000 units of antitoxin, and the dose was repeated in three days but was followed by a severe serum reaction. The antitoxin apparently had no influence on the condition. Local treatment consisted of the use of some iodine and glycerin preparations, the internal administration of potassium iodide, and steam inhalations at home; 300,000 units of penicillin had no effect. Repeated smears and cultures have been the same; that is, those of material from the subglottic region showed a diphtheroid bacillus, and those of material from the pharynx and the tonsils showed nothing.

The crusting of the membrane was not that of a dirty gray diphtheritic membrane. It was more like the crusting of an atrophic mucous membrane. It was more like laryngitis sicca, strictly limited to a subglottic area. Following the guinea pig virulency test made from the first culture, the temporary quarantine was lifted, and the young lady returned to her school, though the clinical picture of nonvirulent diphtheria was still present, both clinically and by laboratory confirmation.

CASE 2.—A boy of 15 years had complained of obstructed nasal breathing for two years. The general health was excellent. The nasal examination revealed a low septal deflection, with mucopurulent material covering the turbinates. Some secretion was present in the nasopharynx. There was no clinical evidence of primary sinusitis. Smear and culture revealed a diphtheria-like bacillus. Twenty thousand units of antitoxin was g
With nasal lavage and gentle treatment of a par
atrophic nasal mucous membrane there was marked
provement. In three weeks the culture was nega
A virulency guinea pig test was not made in this
Clinically he belongs in the group with nonvirulent i
tion. There was no history of contact with, or t
ference of, a virulent type of infection either befor
after his coming under observation. The involve
of the nasal mucous membrane was limited, had
present for some time and showed no tendency to ex
to surrounding tissues. It gradually improved, and
was no recurrence of the disease, though the nasal m
brane remained slightly atrophic and during an a
cold, as was seen at intervals for several years follo
the nonvirulent diphtheria, the secretion from the
membrane would persist for a short time. There
was any clinical sinusitis, and the pathologic ch
limited itself to a definite nasal area.

It is to be regretted that the limitations of faci
for laboratory research has made it impossibl
identify the particular type of diphtheroid orga
present.

SUMMARY

This paper directs attention to the nonviru
form of diphtheria and to the fact that the gu
pig virulency test may save the patient the in
venience and the economic loss from a qua
tine. While the nonvirulent organisms ma
present without any objective signs, one does
in some persons with clinical symptoms lim
to a certain area that a type of nonviru
organism is present which causes an appa
atrophic change of the mucous membran
persistent, is without toxin production, is
affected by antitoxin and does not req
quarantine or segregation of the host.

509 Putnam Building.

Case Reports

DEEP CELLULITIS OF THE FACE AND NECK—LUDWIG'S ANGINA

MAX KIMBRIG, M.D., HUNTINGTON, N. Y.
Associate Otolaryngologist, Huntington Hospital

According to the literature, little attention has en given to pharyngeal involvement in cellulitis the face and neck. The extreme displace- nt of tonsil and uvula in Ludwig's angina sually postoperative) gives evidence of the le extent of the pathologic process in this ease.

There are over thirty-five causes of cellulitis the face and neck, according to Stewart.[1] e most common are infections of teeth and sils, active before or after the removal of these ected organs. In more than 50 per cent of cases the cellulitis is due to infection with the molytic streptococcus.

The choice of treatment, a survey of recent rature shows, depends in large measure on condition of the patient and on the location d spread of the infection when the patient is t examined. Resolution has been reported ases with wet and dry hot packs,[2] hot irriga- ns, administration of sulfonamide compounds,[3] of infra-red rays,[2b] or roentgen rays [4] and in- tion of antistreptococcic and antistaphylococcic ums.[5] Satisfactory results have been reported Herrell and Nichols [6] in extensive cellulitis of floor of the mouth in 6 severely ill patients h septicemia who were treated by local applica- ns of heat and intravenous injections of peni- in only. Surgical treatment is considered the lest treatment" [7] when the patient's condition ws no improvement with chemotherapy and en there seems to be an extension of the area of infection or, in severe cases, when immediate relief must be obtained.[8]

McCaskey [5a] observed that polyvalent anti-streptococcic and antistaphylococcic serums in large amounts and chemotherapy may be effective in aborting the condition before pus forms. Stewart [1] likewise found that sulfonamide compounds are effective in early infections of throat, tonsils and ears but that when necrosis of tissue and destruction of bone have occurred and pus has drained into fascial spaces, chemotherapy is of little value, and surgical drainage is indicated. In the case to be reported, sulfonamide compounds and penicillin were given, but incisions for drainage were also made because of the critical state in which the patient was first seen.

REPORT OF A CASE

A well nourished man aged 27 years (referred by Dr. Charles Robin of Huntington, N. Y.) was admitted to the Huntington Hospital on July 24, 1944, three days after an impacted lower right third molar tooth had been extracted with difficulty, anesthesia having been induced with nitrous oxide–oxygen. He was in a semirecumbent posture, suffering severe pain and unable to open his mouth or protrude his tongue. He had a sense of choking and constriction in the throat. There was difficulty in swallowing liquids. A little serosanguinous fluid oozed into the mouth. Extensive swelling and induration of the right submaxillary region extended past the median line. The temperature was 102 F.; the white blood cell count was 14,000, with 89 per cent polymorphonuclear leukocytes; the urine showed a faint trace of albumin, a few hyaline casts, a few white blood cells, 2 or 3 red blood cells, sugar (4 plus) and acetone and diacetic acid (3 plus); the Wassermann test of the blood was negative; the pulse rate was 69. Sodium sulfadiazine, 37½ grains (2.43 Gm.), was injected intravenously on the patient's admission. Six hours later, his temperature rose to 104 F., and his condition became critical. The jaws were fixed. At this stage, when I first saw him, he was toxic, but fully cooperative, and could not swallow even liquids. The tongue was pushed against the hard palate. The sublingual tissues were swollen, deeply cyanotic and covered with necrotic exudate. Breathing was labored, with suprasternal retraction. Obstructive laryngeal dyspnea was present. Penicillin therapy was outlined, the drug being given orally, locally, intravenously and intramuscularly.

Immediately after the initial intravenous dose of 50,000 units of penicillin was injected, the patient was taken to the operating room. Anesthesia was induced by infiltration of the field with procaine hydrochloride, and a deep vertical incision 2 cm. long was made in

1. Stewart, M. B.: Deep Infections of the Neck, Mil. rgeon **91**:426, 1942.

2. (*a*) Short, A. R.: Minor Surgery of Skin Infec- s, Practitioner **149**:247, 1942. (*b*) Gruber, M. D.: ulitis of Masticatory Structures, Mil. Surgeon **91**: , 1942.

3. Kelly, D. B.: Case of Traumatic Para-Esophageal ulitis, J. Laryng. & Otol. **56**:387, 1941. Doherty, A.: Ludwig's Angina: Report of Two Cases, J. Am. t. A. **28**:588, 1941.

4. Barb, J. C., and Sheppard, A. I.: Deep Cellulitis the Face and Neck Treated with Sulfathiazole and Ray Therapy, Dent. Items Interest **64**:453, 1942.

5. (*a*) McCaskey, C. H.: Ludwig's Angina, Arch. laryng. **36**:467 (Oct.) 1942. (*b*) Short.[2a]

6. Herrell, W. E., and Nichols, D. K.: Penicillin in Treatment of Cellulitis of the Mouth, Am. J. Ortho- tics **30**:1, 1944.

7. Blair, V. P.; Ivy, R. W., and Brown, J. B.: entials of Oral Surgery, ed. 2, St. Louis, C. V. sby Company, 1936.

8. Orton, H. B.: Deep Infections of the Neck, J. A. M. A. **120**:873 (Nov. 21) 1942.

the medial line of the neck and a second incision about 2.5 cm. long under the angle of the jaw, parallel with the body of the mandible. Both incisions were extended by blunt dissection through the mylohyoid musele. About a thimbleful of thick creamy pus was evacuated. Penrose drains were inserted into the two wounds, and a third drain connected the two incisions. There was immediate substantial improvement in breathing, and the patient could move his tongue and jaws perceptibly. A tracheotomy tray was in constant readiness at the bedside for several days. The pus showed Streptococcus viridans.

Breathing and movement of tongue and jaws continued to improve so that he was able to swallow some liquids that evening. On the third day two drains were removed. The urine was normal. At the end of one week the last drain was removed. On the ninth day he could swallow solids with difficulty. On the twelfth day, all drainage ceased, and he was able to eat and chew with comfort. He was discharged from the hospital on Aug. 9, 1944.

The first postoperative evening the temperature of the patient rose to 105 F. This is in agreement with the observation of Stewart,[1] who reported an increase in temperature for several hours after incision. The temperature ranged from 102.6 to 101.4 the first postoperative day and continued on the downward trend until it was normal, the fifth postoperative day.

Penicillin was injected into the wall of the wound immediately after incision. It was also sprayed into the mouth after irrigations of the throat, made at fifteen minute intervals with hot isotonic solution of sodium chloride. It was also given intravenously and intramuscularly (see outline). Sulfadiazine therapy and wet dressings were also continued. On the third day, one could depress the tongue sufficiently to see that the uvula and the right tonsil were still pushed over to the left, well past the midline, and that serosanguinous drainage was oozing from that region.

Total Dosages.—Six hundred and thirty thousand units of penicillin was administered in five days as follows:

1st 24 hours: 90,000 units intravenously in two doses
10,000 units intraorally by spray
20,000 units into wound in one dos
80,000 units intramuscularly in fou
equal doses.

2d 24 hours: 140,000 units
3d 24 hours: 110,000 units
4th 24 hours: 120,000 units
5th 24 hours: 60,000 units
} intramuscularly in dose of 20,000 to 30,000 units

Sodium sulfadiazine (total amount 30 Gm.) was g as follows:

On admission: 37⅓ grains (2.43 Gm.) intraveno

First postoperative day: two doses of 37½ grains intravenously

Second postoperative day: two doses of 37½ gr each intravenously

Beginning with the third postoperative day, fi grains (0.97 Gm.) was given orally every six h day and night, until the total amount was 30 Gm.

SUMMARY

A review of recent literature on the ther of cellulitis of the face and neck shows tha some cases the condition may resolve spo neously, in some it will yield to chemother alone and in others it will demand early surg intervention. The case reported brings out fact that the choice of procedure depends on individual case and the judgment of the surg

In this case, throughout the course of the ease, drainage from the sublingual area was s but drainage from the peritonsillar area was fuse. A striking observation was that in re to the position of the palatine tonsil and uvula, which were pushed over to the left, past the midline.

Dr. Edwin J. Grace outlined the penicillin therap the case reported.

20 High Street.

THROMBOSIS OF A LATERAL SINUS WITH METASTASIS; PENICILLIN THERAPY; RECOVERY

SAMUEL ROSEN, M.D., NEW YORK

REPORT OF A CASE

Jan. 9, 1945, Mr. M. D., aged 64, complained of in his left ear. For three days he took sulfadiazine, ribed by his family physician, and the pain dis- red. One week later there was spontaneous dis- e from the left ear, and again sulfadiazine was . He felt well and continued his daily work in a se factory. Suddenly, on January 23, he complained ere pain in his left ear and intense headache. He chill, vomited and became confused. His temper- rose to 104 F. He was admitted to the otologic e of the Mount Sinai Hospital, New York, on ry 24.

ical Examination.—On admission he was a pale, sick, old-looking man who showed marked rest- ss and confusion. He could not state where he was ould he comprehend questions. The left drum rane was thick, red and swollen, with no landmarks . There was considerable pulsating, purulent dis- e coming through a large anteroinferior perforation. ng in the affected ear was poor. There was marked rness at the tip of the mastoid process and along urse of the internal jugular vein.

ical Course and Laboratory Findings.—Blood cul- revealed luxuriant growths of hemolytic strepto- s (beta) in all flasks, with growth of the organisms nsplantation. A pure culture of hemolytic strepto- s (beta) grew on cultivation of the aural discharge. emperature during the first five days in the hospital d from 101 to 105 F., the ear continued to discharge he bacteremia persisted. Roentgen examination of ft mastoid antrum showed diffuse clouding. The globin content was 75 per cent and the white blood unt was 14,000. There then developed a red, ten- ndurated, spreading swelling over the mastoidal of the emissary vein. At the same time there ed a remarkably rapid swelling of the right knee which was extremely tender and in which the st motion caused exquisite pain. The diagnosis ombosis of the lateral sinus with retrograde throm- of the emissary vein and metastasis to the right oint was made.

ordingly, surgical treatment of the lateral sinus f the jugular vein was advised, while 25,000 units nicillin was given every three hours intramuscu- but the patient refused permission to operate. seventy-two hours of penicillin therapy, striking s occurred. The temperature receded gradually to and then to 99 F., without further rises. The ear became dry and landmarks in the drum mem- again became visible. The swelling around the ry vein diminished progressively, and a few days t disappeared. The marked swelling of the knee egan to recede and gradually to disappear. The organism was susceptible to 1 Oxford unit of penicillin; i. e., it was one time as resistant as the standard organism.

The first blood culture, taken within twenty-four hours after the start of penicillin therapy, was negative. At this time, the general condition of the patient was so much improved that had surgical treatment been instituted, it would have been attended with far less surgical risk than when he was admitted. However, on the fourth and fifth days after penicillin therapy was instituted, the bacteremia recurred, blood cultures on both days showing hemolytic streptococcus even though there were no clinical signs or symptoms of persistent sepsis. In these blood cultures it took the organisms four days to grow and the growth could not be successfully transplanted.

It seemed as if the recurrence of the bacteremia constituted a definite indication for surgical intervention. Instead, the daily dose of penicillin was doubled by adding 100,000 units morning and night, and the bacteremia disappeared. All fifteen blood cultures made thereafter were negative. The penicillin therapy was continued for eleven days. The patient made a complete recovery and left the hospital on March 3, ambulatory. No operation had been performed on the sinus and jugular vein.

COMMENT

The desirable result in this case was most likely achieved by the 100,000 units of penicillin given night and morning in addition to the 25,000 units every three hours. The resultant high concentration of penicillin in the blood undoubtedly allowed the drug to permeate the thrombus in the lateral sinus and destroy the organisms at the source of the bacteremia. Emphasis must be placed on the capacity of penicillin to permeate a thrombus and, therefore, on the importance of large doses such as those given to this patient.

After the first few days of penicillin therapy, the patient's general condition improved so vastly that he certainly offered a better surgical risk than he did immediately on admission to the hospital if at any time a resort to operation had been clearly and finally indicated. The effectiveness of early use of large doses of penicillin in the treatment for thrombosis of a lateral sinus is thus clearly demonstrated. The two positive blood cultures after the first few days of penicillin therapy took somewhat longer to develop than any of the previous ones, and the organisms in these cultures did not grow on transplantation. This implied a reduction in the virulence of the strain and justifies the delaying of surgical intervention.

om the Otological Service, Mount Sinai Hospital.

In other words, study of the behavior of the strain at various times can give information as to the degree of its virulence, thus providing important clues for the total clinical evaluation. A combination of operation and penicillin may give the best results in the largest number of cases. Even though this case demonstrates that penicillin alone can cure an extensive thrombosis of a lateral sinus with thrombosis of the emissary vein, it should not yet be assumed that penicillin therapy has entirely replaced surgical operation in all cases.

CONCLUSIONS

1. Penicillin alone can cure extensive th bosis of the lateral sinus with extension o thrombus into the emissary vein.

2. Prompt, large doses of penicillin are cated in thrombosis of the lateral sinus. observation of the patient and evaluation the facts will then form the basis for the of therapy to be employed.

101 East Seventy-Third Street.

Clinical Notes; New Instruments and Technics

MAGNETIC AID IN INSERTING AN ESOPHAGEAL STRING

MURDOCK EQUEN, M.D., ATLANTA, GA.

n the handling of an esophageal stricture, the most
ficult single technical problem is the first insertion
the string. Once the string is in place the use of
cker's[1] retrograde bougies will improve the stric-
e and in most cases give a functional cure of it.
the problem of getting the patient to swallow a
g is a difficult one even after a gastrostomy has
done and direct feeding instituted and the esoph-
s caused by the caustic has disappeared. Many of
patients with esophageal strictures are children too
g to understand what is expected, and among

g. 1.—Roentgenogram showing the dilator making
ct with a large magnet passed into the stomach
gh a gastrostomy opening.

old enough, some cooperate only after the most
tent efforts. The esophagus itself may be so
acted that even with the most intelligent coopera-
the string will not pass into the stomach. Various

methods have been used, such as floating the string through while the patient is swallowing water, or attaching a perforated shot or a small steel ball to the string to aid its passage.[2] In the Jackson Clinic,[3] the unknotted slightly frayed end of a string is used. After the lapse of sufficient time to allow the string to pass into the stomach, it is by no means easy to find the string. It may be coiled up in the esophagus proximal to the stricture, or, if in the stomach, it may be difficult to locate. Many patients are never able to swallow a string, and for these patients retrograde esophagoscopy with passing upward of flexible-tipped filiform bougies has been suggested. This is a difficult

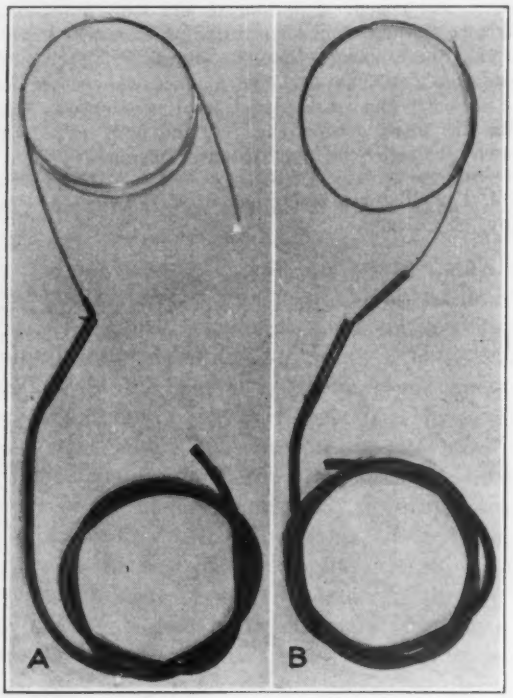


Fig. 2.—*A*, small dilator, and *B*, large dilator, making contact with a magnet attached to a stomach tube.

procedure and fraught with danger. At the Jackson Clinic a much better method, which is quite safe, requires the use of two operators, one of whom performs *per oral*, the other a retrograde, esophagoscopy, getting the tubes close to the obliterated lumen on each side. Then with the region visualized by means of a

1. Tucker, G.: Cicatricial Stenosis of the Esoph-
with Particular Reference to Treatment by Con-
ous String, Retrograde Bouginage with the Author's
ue, Ann. Otol., Rhin. & Laryng. **33**:1180 (Dec.)

2. Vinson, P. P.: The Swallowed Silk Thread as a Guide in Esophageal Instrumentation, Arch. Otolaryng. **13**:94 (Jan.) 1931.

3. Jackson, C., and Jackson, C. L.: Bronchoscopy, Esophagoscopy and Gastroscopy, Philadelphia, W. B. Saunders Company, 1934.

biplane fluoroscope, a bougie is passed upward from one tube to the other. In most sections of the country, however, two experienced operators are not always available.

It is a well known fact that in all esophageal strictures, unless there is complete atresia, there is a lumen, and the problem is to find that lumen as easily and with as little trauma as possible. A new procedure which simplified the problem with no sacrifice of safety is herewith offered. It employs a minute cone-shaped steel dilator[4] and a magnet. The description of how these are used is presented in the following report of a case.

M. J. H., a 15 month old girl, swallowed potassium hydroxide on June 4, 1944. As is customary in such cases, there was a period of about a week that she could not swallow anything, but as the severe inflammatory reaction decreased, swallowing improved and seemed almost normal until the middle of July. Then gradual dysphagia developed, due to the contracture, and on August 2 the child was seen by me for the first time. An emergency gastrostomy was done for feeding purposes and for use in subsequent dilatation of the esophageal stricture. One month later, with the patient under general anesthesia and with fluoroscopic guidance, a small cone-shaped dilator was passed gently through the esophagus into the stomach. Through the gastrostomy opening a large magnet was passed into the stomach and manipulated until contact was made with the small dilator (fig. 1), and both were withdrawn through the gastrostomy opening. Then a string was attached to the small dilator and p back up through the esophagus. The dilator wa moved, the string was withdrawn from the nose the ends of the string were joined outside the The magnet (fig. 2*A*) used was made of Alni permanent type of metal compounded of alumi nickel, cobalt and iron.[5] The small dilator (fig. was made of steel rather than Alnico, as Alnico not be cut down small enough on account of its bility. The present condition of the child over a after the gastrostomy is most satisfactory, and sh gained 12 pounds (5.4 Kg.). Tucker's retrograde b no. 26 French can be passed easily; however, gastrostomy opening is being maintained until s quent dilatation has been made and until the scar t heals.

Every otolaryngologist in the process of doi routine dilatation with Tucker's retrograde bougie experienced the annoyance of having the silk s break. In order that no time be lost when this oc the suggestion is made that a larger dilator (fig. be passed through the esophageal lumen into the s ach, where it can make contact with a large m passed through the gastrostomy opening and withd through this opening. A new string can be att quickly to the dilator and withdrawn through pharynx. This procedure does not require fluoros guidance, as the large dilator can be passed through the established esophageal lumen.

144 Ponce de Leon Avenue, N.E.

4. The dilator is a product of V. Mueller & Company, of Chicago.

5. Alnico is a product of the General Electric Company.

Progress in Otolaryngology

Summaries of the Bibliographic Material Available in the Field of Otolaryngology

TUMORS OF THE NOSE AND THE THROAT

GORDON B. NEW, M.D., AND EDWARD L. FOSS, M.D.
ROCHESTER, MINN.

ORS OF THE NOSE AND ACCESSORY SINUSES

ogdasarian and Stout[1] report a case of ilemmoma of the nasal septum in a man ears old. The tumor was easily removed nasal snare. A review of the literature osed no case of tumor of a nerve sheath on nasal septum.

ooy[2] states that in the differential diagnosis cystic lesion occurring laterally in the nasal and the maxilla four conditions must be idered. Two of these conditions, peridontal resulting from apical granuloma, and igerous cyst, are dental in origin. The two, globulomaxillary cyst and nasoalveo- cyst, are of fissural origin. The author nts a discussion of each type of cyst together 5 case reports.

our cases of sarcoid of the nose are reported Fletcher.[3] Medical treatment of sarcoid is to be ineffective. In 2 of the reported cases lesion was excised surgically and did not r.

ggston[4] believes that radical operation has frequently been replaced by irradiation in treatment of neoplasms of the nose and the pharynx, whether malignant by position or nsically. So far as possible, radical removal ld always be undertaken, regardless of cos- c results. The surgical procedure should be lemented by the most intelligent use of ation, subject to individualization in each

TUMORS OF THE LIPS AND MOUTH

family in which through three generations was a tendency to have bilateral harelip, hypertrophy of mucous cysts in the lower lip and sometimes associated cleft palate was studied by Straith and Patton.[5] In three generations of this family of 13 persons there were 6 persons with bilateral harelip. Some of these patients had associated cleft palate, as might be expected, but more interesting, each had a pair of hypertrophied mucous glands on the lower lip.

Bellinger[6] advises the use of sodium morrhuate as a sclerosing solution for the larger intraoral cavernous hemangiomas.

Two cases of osteochondroma of the coronoid process of the mandible are presented by Shackelford and Brown.[7] Osteochondromas in general are common tumors; however, osteochondroma of the coronoid process is rare. The diagnosis of osteochondroma of the coronoid process is not easy. The important points in diagnosis are slowly progressive, painless limitation of movement of the jaw in a young person, malocclusion in some instances, a bony hard swelling in the region of the zygoma and an abnormal bony projection visualized by roentgenograms taken from the proper angle.

There are now 82 reported cases of mixed tumor of the upper lip and only 5 verified cases of mixed tumor of the lower lip. When Hamrick and Howe[8] reviewed the literature and reported a case of mixed tumor of the lower lip in 1944, it had been ten years since such a case had been reported, the last having been that described by Franssen[9] in 1934.

---

rom the Section on Laryngology, Oral and Plastic ery, Mayo Clinic.

Bogdasarian, R. M., and Stout, A. P.: Neurilem- of the Nasal Septum, Arch. Otolaryng. **38**:62-64) 1943.

Sooy, F. A.: Nasoalveolar Cysts, Laryngoscope 8-28 (Jan.) 1944.

Fletcher, R.: Sarcoid of the Nose, Arch. Oto- g. **39**:470-473 (June) 1944.

Eggston, A. A.: Tumors of the Nose and Naso- nx, New York State J. Med. **43**:2403-2412 (Dec. 943.

5. Straith, C. L., and Patton, H. S.: Bilateral Congenital Mucous Cysts in Three Generations: Three Generations of Mucous Cysts Occurring with Harelip and Cleft Palate, J. A. M. A. **123**:693-694 (Nov. 13) 1943.

6. Bellinger, D. H.: Blood and Lymph Vessel Tumors Involving Mouth, J. Oral Surg. **2**:141-151 (April) 1944.

7. Shackelford, R. T., and Brown, W. H.: Osteochondroma of the Coronoid Process of the Mandible, Surg., Gynec. & Obst. **77**:51-54 (July) 1943.

8. Hamrick, J. G., and Howe, J. S.: Mixed Tumor of the Lip: Report of Two Cases, Including One of Mixed Tumor of the Lower Lip, Arch. Path. **37**:143-146 (Feb.) 1944.

9. Franssen, R., cited by Hamrick and Howe.[8]

Parsons and Henthorne [10] reviewed the literature on extraskeletal osteogenic sarcoma. They state that less than 50 cases of this disease have been described. In addition, they report a case of extraskeletal osteogenic sarcoma of the lip. The patient was a man 53 years of age. This was apparently the first time this condition had been encountered in the lip.

The literature covering the subject of ameloblastoma has been reviewed by Schweitzer and Barnfield.[11] They found only 1 case in which a pulmonary metastasis of such a tumor was demonstrated microscopically. Another case of ameloblastoma in which pulmonary metastasis was demonstrated microscopically is presented. The patient was a 23 year old Negro woman. Schweitzer and Barnfield believe that their case provides additional evidence that there is no apparent correlation between the histologic pattern of the ameloblastoma and its ability to metastasize.

A review of the literature by Chont [12] reveals only 14 cases of adamantinoma with a regional or a distant metastasis. He reports 8 additional cases of adamantinoma; in 1 it occurred primarily in the pituitary body and in 7 in the jaw. Pulmonary metastasis developed in 1 case in the latter group.

Fink and Garb [13] describe a 41 year old woman who presented a metastatic cancer of the tip of the tongue. She had had a radical operation of the breast one and a half years before for carcinoma. A search of the literature failed to reveal any report of a similar case.

One thousand consecutive cases of oral cancer in Bombay, India, are reviewed by Khanolkar.[14] In more than 60 per cent of these cases the disease was situated at the base of the tongue and in the tonsils. The next largest group, which is composed of cases of cancer of the cheek, the floor of the mouth and the alveolus, accounts for 22.5 per cent of the total. Cancer of the lip and the anterior two thirds of the tongue has been relatively infrequent.

The records of patients presenting carcinoma of the lip who had been treated at the New Haven Hospital between the years of 1921 and 1940 were studied by Lawrence and Oughterson.[15] These authors conclude that the treatment of cancer of the lip by radium mould yields a high percentage of successful results. Routine dissection of the neck is not justified and is an unnecessary procedure unless clinical cancer is evident in the lymph nodes. A routine follow-up at frequent intervals is imperative in order that metastasis of the neck may be recognized early.

Cancer limited to the lip has been treated successfully by surgical excision, irradiation with roentgen rays or radium and electrosurgery as well as by less approved methods. Whitcomb [16] believes that any approved method of treatment can be used to destroy a cancer of the lip, success depending on skilful use of the method and not on the method alone. Unless there is invasion of the mandible, the successful destruction of cancer of the lip, irrespective of size, offers no therapeutic problem. The entire lower lip may be removed, if necessary, without impairment of the patient's health, even if the resulting defect is not closed by plastic operation. However, before treating a small cancer of the lip as a trivial condition, one should remember that what may appear to be an insignificant lesion may produce an extensive, incurable cervical metastasis. Operation is a more certain method of treatment for cancer of the lip than irradiation because it does not depend for its success on the unpredictable biologic reaction of the tissues to radiation, called "radiosensitivity." A study of 56 cases in which the patients survived five years is made.

An analysis of 71 case records of second invasive carcinoma of the mandible treated at the University of Minnesota Hospitals and the Tumor Clinic between 1924 and 1943 is made by Buirge.[17] His report includes malignant growths secondary to primary carcinoma of the lip, the buccal mucosa, the lower alveolar process (gingiva) and the floor of the mouth.

10. Parsons, W. H., and Henthorne, J. C.: Extraskeletal Osteogenic Sarcoma: Report of a Case of Osteogenic Sarcoma of the Lip, Ann. Surg. **119**:595-601 (April) 1944.

11. Schweitzer, F. C., and Barnfield, W. F.: Ameloblastoma of the Mandible with Metastasis to the Lungs: Report of a Case, J. Oral Surg. **1**:287-295 (Oct.) 1943.

12. Chont, L. K.: Adamantinoma: Report of Eight Cases, Am. J. Roentgenol. **50**:480-490 (Oct.) 1943.

13. Fink, I., and Garb, J.: Carcinoma of the Tip of the Tongue: A Case of Metastasis from a Malignant Tumor of the Breast, Am. J. Surg. **62**:138-141 (Oct.) 1943.

14. Khanolkar, V. R.: Oral Cancer in Bombay, India: A Review of One Thousand Consecutive Cases, Cancer Research **4**:313-319 (May) 1944.

15. Lawrence, E. A., and Oughterson, A. W.: [illegible] cinoma of the Lip at the New Haven Hospital [illegible] to 1940, Inclusive, Connecticut M. J. **8**:353-357 [illegible] 1944.

16. Whitcomb, C. A.: Cancer of the Lip: A [illegible] of Fifty-Six Five-Year Cases, Am. J. Surg. **6**[illegible] 315 (March) 1944.

17. Buirge, R. E.: Secondary Carcinoma [illegible] Mandible: An Analysis of Seventy-One Cases, [illegible] **15**:553-564 (April) 1944.

TUMORS OF THE NASOPHARYNX

review of 17 cases of late carcinoma of the pharynx has been made by Thompson and es.[18] Cervical nodes were palpable in each Only 2 of the 17 patients were alive at the of the preparation of the report. As to thers, the average length of life after the symptom was twenty-three and four-tenths is. The authors conclude that irradiation produce dramatic temporary relief of symp- in profoundly ill patients. Many patients free of symptoms for weeks or months, complete clinical regression of the primary th and also of the enlargement of the al nodes. Subsequent recurrence of the or of the metastases has been found to dioresistant. Once the diagnosis has been lished, therefore, the patients should be d to the limit of cutaneous and general al tolerance even though there is no longer linical evidence of the disease.

anger and Dyke[19] discuss the roentgen osis of cancer of the nasopharynx. A te diagnosis of nasopharyngeal cancer is n made roentgenologically until osseous es have occurred; however, in not a few cases encountered by Belanger and Dyke entgen diagnosis represented the first time such a diagnosis of the patient's disease seriously been considered. Stereoscopic ination of the base of the skull is important.

w and Stevenson[20] reviewed the records of ases in which the presence of a malignant of the nasopharynx was proved by biopsy. study was made five years after treatment. ypes of lesions the patients had had and ercentage alive five years after treatment iven as follows: all malignant lesions, 13 nt; sarcoma, 26.8 per cent; squamous cell lioma, 8.9 per cent; squamous cell car- a without palpable lymph nodes, 15.6 per and squamous cell carcinoma with palpable n nodes, 7.4 per cent.

ndrosarcoma of the nasopharynx is a . Wirth and Shimkin[21] record the case 6 year old boy with a tumor of the naso-pharynx. This lesion originally was diagnosed as juvenile angiofibroma, but its subsequent course and necropsy proved it to be chondrosarcoma. The tumor grew progressively despite treatment with radon and partial excisions, penetrated into the cranial cavity and metastasized to the lungs. The patient's progress was followed for three years, with periodic biopsies of the tumor.

TUMORS OF THE LARYNX

Congenital laryngeal stridor has been most frequently confused with thymic disease. Trimby[22] holds that simple thymic enlargement is rarely responsible for respiratory embarrassment in infancy. Congenital laryngeal stridor, the most common form of stridor in infancy, must be differentiated from other congenital abnormalities which interfere with respiration, such as a small glottic lumen, a congenital web below the glottis, micrognathia, macroglossia, laryngeal papilloma and cysts. Laryngeal spasm, perilaryngeal abscess, mediastinal tumor, foreign body and at times acute infections are important considerations. The pathologic condition in congenital laryngeal stridor consists of an exaggeration of the infantile type of larynx with undue relaxation of the supraglottic structures. An accurate diagnosis can be made by direct laryngoscopy. The roentgen ray is a valuable aid in the study of these patients, but roentgen therapy is without avail. Since this condition is usually outgrown, active therapy is seldom required.

McCall, Dupertuis and Gardiner[23] state that the treatment of chondroma of the larynx is always surgical and in general the same as that for carcinoma. In some cases, in which the tumor is small, it may be removed by direct laryngoscopy. When the tumor is not too extensive, laryngofissure with complete enucleation of the growth is the method of choice, as this restores the larynx to normal function; when the growth is extensive, laryngectomy is required. If any part of the tumor or its capsule remains, there may be recurrence. The authors report 2 cases. In the first laryngectomy was required because of recurrence after laryngofissures. In the second case the growth was so extensive that laryngectomy including removal of a tumor mass involving the three tracheal rings was done.

Thompson, C. M., and Grimes, E. L.: Carcinoma Nasopharynx, Am. J. M. Sc. **207**:342-348 h) 1944.

Belanger, W. G., and Dyke, C. G.: Roentgen osis of Malignant Nasopharyngeal Tumors, Am. ntgenol. **50**:9-18 (July) 1943.

New, G. B., and Stevenson, W.: End Results atment of Malignant Lesions of the Nasopharynx, Otolaryng. **38**:205-209 (Sept.) 1943.

Wirth, J. E., and Shimkin, M. B.: Chondroa of the Nasopharynx Simulating Juvenile Anoma, Arch. Path. **36**:83-88 (July) 1943.

22. Trimby, R. H.: Congenital Laryngeal Stridor: Lack of Relation to Thymic Disease, J. A. M. A. **122**:740-742 (July 10) 1943.

23. McCall, J. W.; Dupertuis, S. M., and Gardiner, F. S.: Chondroma of the Larynx: Review of the Literature and Report of Two Cases, Laryngoscope **54**:1-17 (Jan.) 1944.

Smith [24] reports that 12 cases of solitary neurofibroma have been described in the literature. He adds 3 cases. The patients were encountered and treated in Jefferson Hospital, in Philadelphia. Surgical excision is the treatment of choice. Removal of tissue for biopsy is usually difficult or impossible in such cases. The final diagnosis is rarely made until complete extirpation has been accomplished.

Papilloma is the most common tumor of the larynx in childhood. It is a benign, self-limited growth that tends to recur but also to disappear at puberty. Ferguson and Scott [25] believe that the treatment of choice for laryngeal papilloma is repeated endolaryngeal excision. In most cases they have accomplished this by direct laryngoscopy with the patient under general anesthesia induced by solution of tribromoethanol U. S. P., 80 to 100 mg. per kilogram of body weight, supplemented with ether. The tumors are gently removed with biting forceps, repeatedly applied. A twisting motion of the wrist cuts off the tumors flush with the adjacent mucosal surface and leaves the basement membrane of the underlying mucosa intact. No resistance is usually encountered unless one has made the error of grasping normal tissue. Tracheotomy is performed only when dyspnea or signs of laryngeal obstruction occur. An effort is made to examine the patient under treatment every two to four weeks, and excisions are carried out as often as recurrence demands. This method of repeated excision is not suggested as a specific means of cure, since in practically all cases these growths tend to recur, but when it is applied at sufficiently frequent intervals, an excellent airway is constantly maintained without the necessity and added risk of a temporary tracheotomy. Fifteen cases of papilloma of the larynx have been reported.

Of 105 cases of laryngeal tumor reviewed by Mitchell,[26] 83 were cases of malignant and 21 of benign tumor. In the remaining case the malignant nature was in doubt. He believes that the treatment of carcinoma of the larynx should be surgical whenever the extent of the lesion permits operation. Roentgen and radium irradiation are too uncertain to warrant employing them in place of operation when the growth is operable; but they sometimes are effective and may be useful in combined treatment. When operation is not possible, irradia naturally is the only recourse.

Ferguson [27] reports 2 cases of fibrosarc of the larynx. Both patients were men. was 60 years of age and the other 65. In menting on these cases the author states such tumors are difficult of pathologic diagn They are microscopically malignant but may follow a clinically benign course and amenable to conservative surgical measures when the growth is large.

Intravenously induced anesthesia for opera on the larynx under direct laryngoscopy is cussed by Adams, New, Lundy and Seld They hold that this method of inducing a thesia has been a decided advance in many of laryngeal operation. It obviates the ha of fire and explosion. It permits adequate laxation in most cases and insures a pleasant postoperative period, free from plications, than when ether is used. To pro adequate relaxation without using exce doses of pentothal sodium, thorough cocai tion of the glottic region is essential. successful and safe application of intrave anesthesia for this type of surgical proce requires the services of an anesthetist skille the induction of anesthesia by intravenous i tion of pentothal sodium and in the manage of its effects.

The mechanism of voice production the laryngectomized patient is discussed McCall.[29] Esophageal voice is dependent o patient's ability to belch, and it is simple learn to belch before laryngectomy than For this reason McCall recommends preo tive voice training.

A method of inducing general anest which was applied in 4 cases of total lary tomy is outlined by Browne,[30] who believes the advantages of general anesthesia are gr than those of cervical nerve block.

Myerson [31] discusses advantages and d vantages of using the technic of hemilary tomy in doing laryngectomy. He reports 2 in which this method of removal was used.

24. Smith, T. T.: Solitary Neurofibroma of the Larynx, Arch. Otolaryng. **39**:144-151 (Feb.) 1944.

25. Ferguson, C. F., and Scott, H. W., Jr.: Papillomatosis of the Larynx in Childhood, New England J. Med. **230**:477-482 (April 20) 1944.

26. Mitchell, H. E.: Tumors of the Larynx: A Review of One Hundred and Five Cases, Laryngoscope **53**:457-477 (July) 1943.

27. Ferguson, G. B.: Sarcoma of the Larynx, Otolaryng. **38**:265-269 (Sept.) 1943.

28. Adams, R. C.; New, G. B.; Lundy, J. S Seldon, T. H.: Intravenously Induced Anesthes Operations on the Larynx Under Direct Laryngo Arch. Otolaryng. **39**:201-202 (March) 1944.

29. McCall, J. W.: Preliminary Voice Traini Laryngectomy, Arch. Otolaryng. **38**:10-16 (July)

30. Browne, G. F.: General Anesthesia for Laryngectomy, Ann. Otol., Rhin. & Laryng. 5 143 (March) 1944.

31. Myerson, M. C.: Application of the Hemi gectomy Technic in Laryngectomy, Arch. Otol **39**:172-178 (Feb.) 1944.

ampbell [32] is of the opinion that in the case healthy patient with an early cancer limited ne vocal cord, or perhaps with limited extento the other cord and without extension the neck, laryngofissure is the treatment hoice. He holds that this does not produce h mutilation. Radiation also might cure a patient, but it is difficult to determine in nce which tumors will respond to radiation. n a patient has a lesion involving both vocal s, the false cords, the base of the epiglottis naybe the aryepiglottic fold, he should be ed the choice of irradiation or laryngec-. Laryngectomy still has a place in laryn- surgery, but it is rapidly becoming an lete operation. No patient with whom pbell has been in contact has chosen laryn- my or has been urged to have the opera- since 1937.

hall [33] classifies cases of carcinoma of the x as follows: group I, those in which there small localized lesion of the vocal cord; p II, those in which an extensive cordal or ottic intrinsic growth is present; group III, in which there is intrinsic involvement intrinsic extension.

ith the small localized cordal growth up I) irradication is preferred if the cancer grade 3 or 4 malignancy, according to ers' classification, and operation if it is of 1 or 2 malignancy. The points in favor surgical procedure are the fact that the tion can be performed with the patient local anesthesia, that the operative mor- is less than 1 per cent, that the period spitalization averages ten days to two weeks hat, unless the vocal process is removed, is frequently regeneration of the vocal When cases are properly selected as le for laryngeal operation by laryngo- e, a three to five year cure can be obtained proximately 75 to 82 per cent of cases, nding on the knowledge and the skill of urgeon.

hen there is involvement of the cord with ottic extension (group II), most radiol- agree that the carcinoma is not radio- ive and that radiation should not be used. ery offers only total laryngectomy as a hope re.

ith the extensive intrinsic and extrinsic car- a (group III), particularly that of grade 3 or 4, irradiation is the treatment of choice, although it may be only palliative.

Cunning [34] expresses the opinion that roentgen therapy for laryngeal growths is still in the experimental stage and that operation, followed by roentgen therapy, should be instituted whenever possible.

Cutler [35] holds that it is feasible to test the radiosensitivity of cancer of the larynx by a partial course of roentgen therapy before deciding between laryngectomy and irradiation in doubtful cases. He states that when laryngectomy follows irradiation there is some delay of healing in the irradiated region.

Treatment of laryngeal cancer may be by surgical removal, by irradiation or by a combination of the two methods. Blady and Chamberlain [36] believe that each procedure is indicated in certain cases and has certain advantages. These methods of treatment are not competitive. That particular method should be selected which in the individual case offers the patient the greatest chance of survival. The authors make an analysis of 36 cases of carcinoma of the larynx.

TUMORS OF THE TRACHEA

Palmer [37] reports a case of oncocytoma of the trachea in which the patient was treated for asthma previous to the establishment of a correct diagnosis. For this reason he holds that when the patient has an "asthmatic wheeze" audible at the open mouth, bronchoscopy is indicated to eliminate the possibility of an intratracheal tumor causing symptoms resembling asthma.

Schwartz [38] presents 3 cases of adenoma of the tracheobronchial tree. In 2 cases the tumor was in the bronchus; in the third case it was in the extreme upper portion of the trachea.

Two cases of carcinoma of the trachea in which treatment was by roentgen therapy are reported by Brown, Weiss, Iglauer and Fine.[39]

Campbell, A. A.: Cancer of the Larynx (with vation on One Hundred and Three Cases), Canad. J. **49**:509-512 (Dec.) 1943.

Schall, L. A.: Carcinoma of the Larynx, New nd J. Med. **229**:574-576 (Oct. 7) 1943.

34. Cunning, D. S.: Advances in Treatment of Cancer of the Larynx, Tr. Am. Acad. Ophth. **48**:231-236 (March-April) 1944.

35. Cutler, M.: Cancer of the Larynx: A Radiotherapeutic Test as an Aid in Choosing Between Operation and Irradiation, Arch. Otolaryng. **39**:53-58 (Jan.) 1944.

36. Blady, J. V., and Chamberlain, W. E.: Treatment of Cancer of the Larynx by Roentgen Irradiation: A Report of Five Year End-Results, Am. J. Roentgenol. **51**:481-495 (April) 1944.

37. Palmer, A.: Oncocytoma of the Trachea, Laryngoscope **53**:377-382 (June) 1943.

38. Schwartz, L.: Adenoma of the Trachea and the Bronchus, Arch. Otolaryng. **39**:231-242 (March) 1944.

(Footnotes continued on next page)

TUMORS OF THE ESOPHAGUS

A general discussion of carcinoma of the esophagus and of the determination of its operability is presented by Garlock.[40] He believes that the average patient with cancer of the middle third of the esophagus stands a 60 per cent chance of surviving the operation and a 30 per cent chance of living more than one year. The patient who has squamous cell cancer of the distal third of the organ has approximately a 70 per cent chance of surviving the operation and almost 100 per cent probability of living more than two years.

The second and third cases of successful transthoracic resection of the stomach and esophagus with esophagogastrostomy performed at the Mayo Clinic are reported by Clagett and Wiig.[41] Some of the many technical details of this operation which must be borne in mind are discussed.

Radiation therapy of carcinoma of the esophagus requires a skilful clinical evaluation of all possibilities, including careful appraisal of the patient's general condition and of the state of his circulatory organs. Buschke and Cantril[42] believe that it should be attempted only if there is reasonable hope for either satisfactory palliation or permanent cure.

Yudin[43] discusses the types of reconstructive surgical procedure used in 80 cases of esophageal stricture in which it was found necessary to create an artificial esophagus. The results of these operations are analyzed.

Fleming[44] states that it is only in the field of earlier diagnosis that a more hopeful outlook in cases of carcinoma of the esophagus can be found. In the interval between the development of the lesion and the onset of treatment metastasis has developed in most cases. An investigation of postmortem reports previously published se to suggest a rough relationship betw the extent of the local lesion and degree of metastatic spread. The look usually is more hopeful in cases in w the lesion does not exceed 5 cm. in length in those in which it has spread beyond this l On the basis of the latter observation it is gested that in cases in which the growth an early stage and a radical cure is felt t possible, the use of an extremely narrow be abandoned in favor of a somewhat sh but wider one.

Eighty-five cases of cancer of the esoph that were encountered in the departmen radiology of the University of Wisconsin tween 1928 and 1941 have been reviewed Pohle and Benson.[45] In most cases the dis was in an advanced stage. The average d tion of life after admission was six and se tenths months, although about 10 per cen the patients lived longer. One patient who cancer of the upper end of the esophagus w was treated with roentgen radiation alone mained well for more than four years, another whose cancer was treated with roen radiation and by implantation of radon s remained well for more than seven years. both cases the diagnosis was confirmed h pathologically.

Smithers[46] discusses his reasons for the s tion of high voltage roentgen radiation a long strip field in the treatment of carcin of the esophagus, together with his metho treatment and the results.

Miscall and Clark[47] report the use of Murphy button in 2 cases of carcinoma of lower third of the esophagus in which the tient was subjected to resection and pri esophagogastrostomy. In both cases satisfa anastomosis was obtained. One death occu from extrapleural infection.

Although a tumor of the cardiac end o stomach can most adequately be exposed resected through the thorax, Dorsey[48] be

39. Brown, S.; Weiss, H. B.; Iglauer, S., and Fine, A.: Carcinoma of the Trachea: Report of Two Cases Diagnosed and Treated by Roentgen Rays, Radiology **41**:394-397 (Oct.) 1943.

40. Garlock, J. H.: The Diagnosis and Surgical Treatment of Cancer of the Esophagus, Proc. Inter-State Postgrad. M. A. North America (1943), 1944, pp. 186-190.

41. Clagett, O. T., and Wiig, L. M.: Transthoracic Resection of Esophagus and Stomach for Carcinoma: Report of Two Cases, Proc. Staff Meet., Mayo Clin. **18**:337-344 (Sept. 22) 1943.

42. Buschke, F., and Cantril, S. T.: Supervoltage Roentgen Therapy of Esophageal Carcinoma, Radiology **42**:480-492 (May) 1944.

43. Yudin, S. S.: The Surgical Construction of Eighty Cases of Artificial Esophagus, Surg., Gynec. & Obst. **78**:561-583 (June) 1944.

44. Fleming, J. A. C.: Carcinoma of the Thoracic Oesophagus: Some Notes on Its Pathology and Spread in Relation to Treatment, Brit. J. Radiol. **16**:212-216 (July) 1943.

45. Pohle, E. A., and Benson, R. R.: Ra Therapy in Cancer of the Esophagus: An A of Eighty-Five Cases Observed During the La cade, Am. J. Roentgenol. **50**:89-98 (July) 194

46. Smithers, D. W.: The X-Ray Treatme Carcinoma of the Oesophagus, Brit. J. Radio 317-322 (Oct.) 1943.

47. Miscall, L., and Clark, B. B.: The M Button in Esophagogastrostomy, Surgery **1** (July) 1943.

48. Dorsey, J. M.: Surgery of Malignant T of the Cardiac End of the Stomach and of the minal End of the Esophagus, S. Clin. North A **24**:225-237 (Feb.) 1944.

preliminary celiotomy is advisable. The ence of metastases can be most readily de- ined through an upper abdominal incision enough to admit the surgeon's hand. If etastasis is present, further surgical pro- ure is not advisable; otherwise transthoracic loration is undertaken immediately. The or recommends that squamous cell cancer the lower part of the esophagus, which is slow to metastasize, should be approached transthoracically without preliminary celiotomy. Cancer at any level from the bifurcation of the trachea downward metastasizes to the lymph glands in the gastrohepatic ligament and does so before it involves the adjacent lymph glands. For this reason a transthoracic procedure should be performed through the left side of the chest. The technic of the transthoracic operation is discussed.

TONSILS AND ADENOIDS

J. DUDLEY SINGLETON, M.D.
DALLAS, TEXAS

A review of American and British literature for 1944 on the subject of tonsils and adenoids reveals the effects of the world conflict. Fewer articles appeared, and of these a large number were from the men serving the Armed Forces. The men in the service have shown a great deal of interest in the use of sulfonamide compounds in the treatment of acute tonsillitis; others have reported epidemic outbreaks of acute tonsillitis and pharyngitis. Several authors have reported studies made on the relationship of tonsillectomy and adenoidectomy to poliomyelitis. A few articles deal with the prevention and the control of postoperative hemorrhage.

TONSILS

General Considerations.—Heatly,[1] in discussing "chronic disease of the nose, throat, and ear" describes briefly the anatomy of the lymphoid tissues of the throat. He states:

> A clear understanding of the histologic structure of these tissues is necessary to a proper appreciation of the many disturbances caused by chronic infection. The principal point of interest in this respect lies in the structure of the crypts. These are particularly well developed in the palatine tonsils where they are narrow, deep and ramified in contradistinction to the wide-mouthed, superficial and short crypts seen in the other lymphatic structures of the throat. The epithelium lining these crypts, notably in the palatine tonsils, contains a rich network of capillaries. We know from microscopic study that chronic infection results in ulceration and destruction of portions of this lining epithelium, thus producing a thrombosis of innumerable capillaries as well as many of the larger collecting veins which lie just under the epithelium. The mouths of such infected crypts are frequently closed by the formation of scar tissue, thus intensifying the infection through lack of drainage. There are no mucous glands in these crypts to assist in the expulsion of bacteria and debris. The possibilities for dissemination of infection are further enhanced by the constant movements of the throat as well as by the compression incident to swallowing. It has been estimated that 75 per cent of all primary foci of infection occur in the mucous membranes of the head. The high incidence of chronic tonsillitis in this group can be easily understood in the light of [illegible] considerations.

The author advises the removal of chroni[c] diseased tonsils (1) in the presence of [a] glomerulonephritis, (2) for the preventio[n] acute rheumatic fever and (3) for the reli[ef] certain forms of arthritis, "notably the infec[tious] or rheumatoid group." In regard to all[ergic] patients he advises against the removal of to[nsils] during the stage of active allergic symptoms, [and] by inference he advises against tonsillec[tomy] during epidemics of poliomyelitis.

Epstein,[2] in discussing the indications for [ton]sillectomy, states that the physician in ge[neral] practice and the pediatrician should have a [clear] definite opinion as to whether an operati[on is] indicated before referring a patient to a sur[geon] operating on ear, nose and throat. He [calls] attention to the fact that the theory of [focal] infection and the necessity for operation [are] closely connected and points out that sinc[e the] former has been heavily attacked, the deci[sions] for the latter are becoming more and [more] difficult. He refers to publications by I[sch]worth, Reimann and Havens, and Ash, in w[hich] they disagree with the theory that the tonsil[s play] an important role as a focus of infection. [The] author lists as definite indications for tons[illec]tomy in children repeated sore throats, qu[insy], mechanical obstruction to breathing, recu[rrent] attacks of otitis media and abscess of the m[iddle] ear.

Shepard[3] describes in considerable detai[l the] preoperative medication and the technic of i[nfil]tration to obtain local anesthesia for bipolar d[es]truction of the tonsils. In performing the disse[ction] the mucosa is incised before the tonsil-gra[sping] forceps are applied. The incision is carried [down] near the lower end of the anterior pillar up[ward] along the free margin of the anterior pillar [fold] and around the edge of the plica semilunari[s] down the posterior pillar, care being tak[en]

1. Heatly, C. A.: Chronic Diseases of the Nose, Throat, and Ear, M. Clin. North America **28**:330-338 (March) 1944.

2. Epstein, B.: Indications for Tonsillectom[y], General Practitioner's Outlook, South African [J.] **18**:59-60 (Feb. 26) 1944.

3. Shepard, E. P.: Bipolar Tonsillectomy, Otol., Rhin. & Laryng. **53**:759-763 (Dec.) 1944.

e only through the mucosa. The tonsil is ped, and a Marschik dissector is used to se the "pseudo-capsule" of the upper pole; portion of the tonsil is grasped, and the dis- ion is carried along its dorsolateral surface. r freeing the dome of the upper lobe, scis- are used to dissect the tonsil from the fossa. r the upper pole is freed, the incision of the osa of the anterior pillar is carried down to, ear, the attachment of the pillar to the base he tongue. At this stage an Allis clamp is to grasp the anterior portion of the "pseudo- ule" of the inferior pole. The inferior pole ssected from below in much the same man- as the upper pole. When the tonsillopharyn- muscle is exposed from above and below, val of the tonsil is completed by application e snare.

Hall[4] reports a study of Actinomyces in the ils and an attempt to correlate the histologic rvations as indicated by the discovery of nomycotic clumps in the tonsils with the clin- picture in the patients. He includes a corre- n with the mycologic and clinical studies of r writers. The article is well summarized he author as follows:

tinomycotic clumps were observed in 94 histologic ns derived from 438 consecutive pairs of tonsils.

tinomycotic organisms are frequent inhabitants of s, identified in smears of granules from 37 per cent per cent of pairs of tonsils in fresh specimens ons), 14 per cent in primary culture and 11 per in pure culture (Emmons) and in 21.46 per cent stologic sections in the present series (Hall). Its nce is not seasonal or epidemic and shows a dif- t age incidence as compared with that of the usual of tonsillectomy.

tinomyces are found histologically more frequently se tonsils which are grossly enlarged and con- considerable demonstrable debris and pale yellow les. The absence of these features does not ex- the presence and histologic identification of the ism.

stologically, actinomycotic clumps are almost always in the tonsillar crypts, but there is a very frequent panniment of considerable inflammatory response in ature of a leukocytic mantle about the fungus on-specific inflammation in the adjacent tonsillar exhibiting polymorphonuclear leukocytic invasion lceration. True actinomycotic invasion and infec- of the tonsillar stroma is quite rare but does occur.

actinomyces occurring in tonsils and tonsillar has been identified (Emmons and others), ally and by animal inoculation as A. bovis, a -aerophilic ray fungus, capable of producing true mycotic lesions in other parts of the human body dentical with organisms which have caused such s.

Clinically, there is little to indicate the presence of actinomyces in the tonsils. The usual history is that of sore throat of varying duration in an older patient group submitted to tonsillectomy for non-specific causes. When actinomyces are identified by histologic examination, by culture or by smear, it is quite rare to find evidence by physical or roentgen examination of the presence of this infection elsewhere in the body. None was observed in the present series. In other words, we might say that actinomyces in the tonsillar crypts should receive no more comment than the discovery of Spirochaeta dentium in dental tartar or B. Welchii in the lower gastro-intestinal canal. Each organism must be considered solely in terms of the site of its discovery. Just as it is quite natural to find B. Welchii in the colon and S. dentium in the dental tartar, so we may consider the tonsillar crypts as the natural nidus for growth of actinomycotic organisms. And it is these organisms that have been identified as A. bovis by Emmons, Lord and others. It is only when we find B. Welchii outside of the intestinal canal and S. dentium in other sites as in pulmonary lesions, and A. bovis in other tissues than the tonsillar crypts that we attach any importance to their discovery and consider them truly pathologic.

Histologically, there are no constant features to identify or indicate the pathogenicity of the ray fungus observed. Particularly, the hyaline eosinophilic peripheral ray hyphal buds may be absent and even the characteristic radial arrangement of the mycelial hyphae may be defective. Where observed in the histologic section, more positive identification is possible with the differential Gram-Weigert stain.

CONCLUSION

Actinomyces of the tonsillar crypts, frequently demonstrable histologically in typical and atypical forms, is a true pathogen, existing and growing in a relatively saprophytic state locally, causing varying degrees of inflammatory reaction in adjacent tonsillar tissues and capable, on discharge or transportation to other tissues, of producing a typical, dangerous, pathologic actinomycotic lesion. Tonsils carrying or producing debris or granules are thus potential sources of this fungus and their removal is advised. This should be supplemented by physical check-up, possibly followed by roentgen examination of the chest, in all cases histologically showing actinomyces in the tonsils, and may be repeated in six and twelve months.

Dingle[5] and associates noted that approximately 10 per cent of all patients admitted to the regional hospital, Fort Bragg, N. C., for respiratory disease had exudate in the pharynx or on the tonsillar tissue. As a result of this observation, they undertook a study for the purpose of determining the causes and the clinical characteristics of exudative tonsillitis and pharyngitis, with special regard to the importance of beta hemolytic streptococci.

Hall, W. E. B.: Actinomyces in the Tonsils, Am. n. Path. **14**:215-228 (April) 1944.

5. Commission on Acute Respiratory Diseases: Endemic Exudative Pharyngitis and Tonsillitis; Etiology and Clinical Characteristics, J. A. M. A. **125**: 1163-1169 (Aug. 26) 1944.

The authors summarize their article as follows:

One hundred and sixteen hospital patients having exudate in the pharynx or on the tonsils at the time of initial examination were studied. On the basis of laboratory data the following classification was made: 25 per cent of the patients had beta-hemolytic streptococci and exhibited a rise in titer of streptococcus antibodies during convalescence, 25 per cent of the patients had streptococci but did not develop antibodies, and 50 per cent of the patients had no streptococci. Definite differences were demonstrated between cases with antibodies and those without, in regard to mode and rapidity of onset, total frequency of symptoms, severity of certain physical signs and leukocyte count. Cases with beta-hemolytic streptococci which did not develop antibodies were similar in clinical characteristics to cases which did not exhibit streptococci. It is concluded that in approximately 25 per cent of the cases studied the exudate was caused by beta-hemolytic streptococci, while in 75 per cent of the cases the causative agent was unknown. Except for the presence of exudate, the latter group did not appear to differ from the great majority of cases of undifferentiated respiratory disease.

Wilson [6] reports an epidemic of hemolytic streptococcic tonsillitis that occurred on a station of the Royal Air Force in November 1942. Of a total personnel of 365 officers and men, 89 airmen were affected, 4 on the first day, 42 on the second day, 25 on the third day, 8 on the fourth day, 5 on the fifth day and a total of 5 on the sixth, seventh and eighth days. Investigation revealed that all of the patients were from a group that dined in a particular mess. There was no relation between the incidence of cases and the distribution of the personnel in the sleeping billets. On investigation it was found that one of the cooks, who had handled the milk two or three days before the first case was seen, was suffering from a severe cold at the time and was sneezing continuously. Cultures of material taken from his throat showed that he was heavily infected with hemolytic streptococci of the same strain as those isolated from the patients.

The author concludes his article in part as follows:

It is concluded that this was an epidemic in which the infection was primarily food-borne, with case-to-case spread playing a very minor part. It is thought that the reason for the comparatively small incidence of case-to-case infection may have been the fact that those susceptible had been picked out by the primary infecting agent, the few who escaped this hazard rapidly succumbing to "droplet infection." This is borne out by the remarkably large number of immunes—probably at least 50% of the community.

6. Wilson, T. S.: An "Explosive" Outbreak of Haemolytic Streptococcal Tonsillitis on an R. A. F. Station, Brit. M. J. **2**:275-276 (Aug. 26) 1944.

Ogden [7] reports four separate outbreak acute follicular tonsillitis that occurred du the year ending with June 1944, at Fort Fra E. Warren. He first reports an outbreak occurred on June 22, 1943, when 40 pat with acute follicular tonsillitis reported to call from one company. Eighty-three per of these patients had throat cultures positive beta hemolytic streptococci. The second break described occurred on June 14, 1943, 40 patients with acute follicular tonsillitis ported to the dispensary from a single com on the first day, and two days later 8 patients reported. Ten cultures of mat taken at random from this group were repo positive for beta hemolytic streptococci. contact was found to explain this outbreak

In still another company, 8 men reporte sick call on July 26, 1943, all suffering acute follicular tonsillitis. Material for cu was not taken from these patients. Five before this outbreak a patient who had been charged from the hospital after partial reco from scarlet fever had returned to the barra culture of material from the throat of this pa was reported to have yielded a growth of beta hemolytic streptococcus, and examina showed that he had acute cervical adenitis.

On Feb. 24, 1944, in a "clean" urologic w 18 patients were found to have throat cult positive for beta hemolytic streptococci. Tw days before this outbreak acute tonsillitis veloped in a patient who was immediately lated. It is assumed that this patient was contact for the outbreak. On the same day a ward for patients with respiratory dise 22 patients were found to have throat cult positive for beta hemolytic streptococci. low-up studies on all personnel in these breaks have revealed no complications of str coccic disease.

Rock [8] discusses staphylococcic septice gives a partial review of the literature on the ject and reports a case. In his discussion quotes Kolmer's definition of the disease as infection of the blood by staphylococci, pathogenic presence and products in the b associated with an infection of fixed tissues sulting in severe constitutional disturbances signs of sepsis." He calls attention to the that the portal of entry may be from a m abrasion of the skin or a mucous membran

7. Ogden, O. S.: Isolated Outbreaks of Streptoc Sore Throat, Bull: U. S. Army M. Dept., Dece 1944, no. 83, pp. 118-119.

8. Rock, J. E.: Staphylococcic Septicemia, Ton in Origin, J. Iowa M. Soc. **34**:10-13 (Jan.) 1944.

ple, a small furuncle, the wound of a minor
ation, local trauma, infected tonsils and other
ces. The diagnosis of the condition is based
the signs and symptoms of the disease and
ated positive blood cultures. In patients
er 50 years of age the disease is apt to be
e, fulminating and toxic, while in older per-
s it produces symptoms that indicate a focal
tion with gradual degeneration of the body
esses such as are seen in extended illnesses.
omplications are common and may occur in
er cent or more of the cases. Metastatic
esses often occur and are dangerous when
cannot be drained surgically. Treatment
sists of supportive measures, blood transfu-
s, drainage of accessible abscesses and ad-
stration of adequate doses of a sulfonamide
pound. The author cautions against the use
ulfadiazine if blood transfusions are being
n.

Clarke [9] reports in considerable detail a case
uinsy complicated by deep pharyngeal throm-
s and multiple infarcts of the lungs. His
ments on the case follow:

this case of quinsy, venous thrombosis resulted in
ation in the deep pharyngeal plexus, which
ally drained back into the pharynx through the
al thrombosed vessel. This was demonstrated by
t that light pressure produced green pus via the
or tonsillar fossa. Further complications resulted
tensive relatively sterile thrombosis throughout
the whole of the cervical portions of the internal
r vein.
is suggested that the rigors resulted from almost
pieces of clot and that the ensuing metastases
ed sterile pulmonary infarcts.

ift [10] briefly discusses various nasopharyn-
radium applicators designed by Crowe and
r, Farrior and Richardson, and Emerson,
y and Heatly. He describes his applicator
llows:

accompanying illustrations show (fig. 1) the gen-
haracteristics and (fig. 2) the position of the
ator when in place. Its overall length is 6½ inches
cm.). It consists of four parts: a brass capsule
which is capable of holding five 10 mg. needles or
mg. capsule of radium; a shaft of silver wire; a
(*A*) 1 inch (2.5 cm.) in length with one surface
ed; a sliding stop (*B*) which automatically locks
position desired. This stop consists of a metal
nited to an ordinary tie pin clasp. When the
ator is inserted and the capsule rests in the proper
n, the stop is moved along the shaft until it rests
the nose, where it locks. It is held in place by a strip of adhesive tape, and if by any chance there should be a tendency for the applicator to slip out as in a recent case of mine, because of the slipping of the tape, this can be detected immediately.

Keller [11] describes and illustrates a modification of the cutting blade of the LaForce tonsillectome which he claims is more satisfactory than the original type. In the modified instrument one side of the cutting blade is somewhat longer than the other side; as a result, the cutting occurs on an oblique angle. The frame of the instrument is also modified to accommodate the blade.

Stovin [12] discusses acute tonsillitis from the standpoint of the symptom complex, the duration of the disease, the bacterial findings and the treatment. He briefly reviews the literature on the treatment of the disease with various bismuth compounds and quotes Lewis as saying that bismuth is a "highly effective agent in the treatment of most types of acute tonsillitis." The author has used the bismuth salt of heptadienecarboxylic acid in a suppository in 40 cases with gratifying results. Symptoms are usually alleviated or completely relieved in twenty-four to forty-eight hours. Ten cases are reported in considerable detail.

Relation of Poliomyelitis to Tonsillectomy and Adenoidectomy.—Howard [13] reports on the relationship of poliomyelitis and tonsillectomy, reviews the literature on the subject and makes an analysis covering a seven year nonepidemic period from 1937 to 1943 based on the tonsillectomies performed in the hospitals of Cincinnati during the months of July to October inclusive; during this period 257 cases of poliomyelitis occurred, of which 233 were in the months of July to October, inclusive. Only 6 cases of poliomyelitis developed following recent tonsillectomies and adenoidectomies. The approximate ratio of cases of poliomyelitis to tonsillectomies and adenoidectomies during the months included was 1 to 2,000.

The author points out that throughout the nation most cases of poliomyelitis occur during the months from July to October inclusive, with the exception of Texas and California, where the disease generally starts in June and continues through November.

Clarke, R. R. J. R.: Quinsy, Complicated by Pharyngeal Thrombosis, Multiple Infarcts of the and Myocarditis, Brit. M. J. **2**:532-533 (Oct. 44.

Clift, M. W.: A New Nasopharyngeal Radium ator, Arch. Otolaryng. **40**:208-209 (Sept.) 1944.

11. Keller, F. E.: Modification of the Blade of the LaForce Tonsillectome, Arch. Otolaryng. **40**:59 (July) 1944.

12. Stovin, J. S.: Treatment by Rectal Administration of a New Bismuth Compound, Arch. Otolaryng. **39**: 259-262 (March) 1944.

13. Howard, R. E.: Relationship of Poliomyelitis and Tonsillectomy, Ann. Otol., Rhin. & Laryng. **53**: 15-34 (March) 1944.

The concluding pages of his article follow:

It is important, at least in the four months of epidemic years when poliomyelitis most often occurs, to follow the suggestions of the Kansas State Board of Health and the Chicago and Boston plans and adopt certain measures to protect the individual against receiving a dose of virus large enough to cause the serious complication of poliomyelitis.

1. Unnecessary meetings should be omitted and one should avoid congested places.
2. Personal contact, such as kissing and hand shaking, should be avoided.
3. Pets should not be handled and steps should be taken for protection against insects of all kinds.
4. People should avoid using drinking and eating utensils outside of their own home.
5. Milk should be pasteurized or boiled.
6. Individuals should keep fit, eat proper foods, and get plenty of rest and fresh air.
7. Use of nasal antiseptics is not advised as it disturbs the normal protective mucous film on the mucous membranes of the nose.
8. Swimming should be avoided as water may be contaminated.
9. Operations on the nose and throat, especially tonsils and adenoids, should be postponed.

In nonepidemic years it would be wise to follow the first eight of these suggestions as a postoperative guide to prevent exposure to the virus in the summer months.

CONCLUSIONS

1. The possibility of poliomyelitis during July, August, September and October in nonepidemic years following tonsillectomy and adenoidectomy is minimal, but when it does occur, it is serious and most often bulbar in type. Ratio: one case in 2,000 operations.

2. The possibility of poliomyelitis following tonsillectomy and adenoidectomy in the other eight months is nil, except in Texas and California, where the poliomyelitis season is extended from June to November and sometimes includes December.

3. Preventative medicine as practiced now by Boards of Health throughout the nation shows that during months and years when there are epidemics of poliomyelitis operations on the nose and throat should be avoided whenever possible for the safety of patients, and I believe it is wise for otolaryngologists to cooperate in this respect.

Page [14] reports on the relationship of tonsillectomy and poliomyelitis after a study of the records of the Manhattan Eye, Ear and Throat Hospital covering a five year period from 1937 to 1941, inclusive. During that time 941 cases of poliomyelitis were reported in the city of New York, with 56 deaths. During the same period 27,849 cards were sent out by the Manhattan Eye, Ear and Throat Hospital requesting answers to questions on a return postal card. A total of 8,915 replies was obtained, and among them 1 case of poliomyelitis was reported. In the New York Department of Health repo 404 cases of poliomyelitis, with 8 deaths. lowing this epidemic 7,500 cards were sent and 3,500 replies were returned, with no illn being reported.

Lucchesi and LaBoccetta [15] reviewed 432 of poliomyelitis at the Philadelphia Hospital Contagious Diseases. The study concerned tients admitted from 1937 to 1942 inclusive, was made to determine the relationship o presence of tonsils and adenoids to the and the mortality of the disease. They f that the incidence of bulbar and bulbos poliomyelitis was significantly higher in pat whose tonsils and adenoids had been rem Patients under 6 years of age constituted largest group, 180. There were 19 pat under 6 years of age whose tonsils and aden had been removed, and 8 of these, or 41 cent, had bulbar involvement; of the rema 161 patients in this age group, only 13, or 8.1 cent, had bulbar involvement. Of the group of 432 patients, 18 died and 14 of t or 78 per cent, had had tonsillectomy or noidectomy. The authors state that tonsils adenoids should not be removed unless the some specific indication for doing so.

Sulfonamide Compounds in the Treatme Acute Tonsillitis.—Fries,[16] in order to esta the relative efficacy of the local and syst administration of sulfonamide compounds i treatment of acute follicular tonsillitis, stu the problem under controlled conditions, u hospitalized patients.

During the winters of 1943 and 1944 a s of 405 young men who had definite evid of acute follicular tonsillitis were hospitaliz a separate ward devoted to their care. Du the first year of the study the patients divided into two groups of 100 patients The throats of group 1 were irrigated with saline solution every four hours. Thos group 2 were also given this treatment four hours; in addition a sulfanilamide spray used to treat the tonsils and the pharynx two hours except while the patients were as and powdered sulfanilamide was sprayed the throat eight times daily, the total daily

14. Page, J. R.: Tonsillectomy and Poliomyelitis; One Case of Poliomyelitis Following 8,915 Tonsillectomies, Arch. Otolaryng. **39**:323-324 (April) 1944.

15. Lucchesi, P. F., and LaBoccetta, A. C.: Rel ship of Tonsils and Adenoids to the Type of Poli elitis: An Analysis of Four Hundred and Thirty Cases, Am. J. Dis. Child. **68**: 1-4 (July) 1944.

16. Fries, E. D.: The Treatment of Tonsillitis Small Doses of Sulfonamides, J. A. M. A. **126**: (Sept. 9) 1944.

ng from 500 to 800 mg. During the second
r the throats of a third group, consisting of
5 patients, were irrigated with hot saline solu-
n every four hours, and 125 mg. of sulfa-
zine was taken by mouth four times daily.
oup 4, of 90 patients, was treated in the same
y as group 2 except that "micraform" crystals
sulfadiazine were used.

The author's comment and conclusions follow:

COMMENT

ur data demonstrate that small, nontoxic doses of
onamides will appreciably reduce the period of illness
ciated with tonsillitis, irrespective of the route of
inistration of the drug. That the difference between
sulfonamide treated groups and the control group is
is indicated by statistical examination of the data.
small difference between groups 3 and 4 and group
n be attributed to the well known fact that sulfa-
ine is more effective in infections caused by the
olytic streptococcus than is sulfanilamide.
he fact that the patients in group 3, who received
Gm. of sulfadiazine daily in tablet form, showed a
of recovery comparable to the groups receiving
l spray raises the question of the advisability of
g topical therapy in the treatment of tonsillitis. As
ets are more easily administered than local spray,
e is no clinical reason for the use of the latter in the
tment of this condition.
he saving of even one day in hospitalization has
h economic and military importance, since, when the
dence of tonsillitis is considered, this saving can be
slated into terms of thousands of man-days salvaged.
view of the fact that the patients receiving sulfon-
des experienced subjective relief even though some
dual signs of subsiding of inflammation remained, it
ossible that such patients can be discharged to
tary duty or to industry as soon as the temperature
mes normal, with the stipulation that they continue
ake small doses of sulfadiazine for several days
reafter. A further saving of time would thereby
lt.
is possible that the use of more than 500 mg. of
adiazine daily would have further hastened recovery.
wever, when dealing with a potentially harmful drug,
lance must be struck between effective and toxic
ge. The complete absence of sulfonamide reactions
e treated groups favors the use of small dosage in
treatment of tonsillitis. This does not imply that
e small doses of sulfonamides necessarily are effec-
in other infections.

CONCLUSIONS

The administration of small doses of sulfonamides
eciably shortens the course of acute follicular ton-
is and minimizes the complication of peritonsillar
ess.

Small doses (500 mg. per day) of sulfadiazine
inistered by mouth in tablet form are as effective
e local application of sulfonamides to the tonsillar
in the form of a powder spray. The ease of admin-
ion makes the systemic route the ideal therapeutic
edure.

There were no toxic or sensitization reactions
rved in any of the 305 patients receiving sulfon-
es in the doses given.

Gettelman and Kaiz [17] carried out a study in a naval dispensary on the value of the sulfonamide compounds in the treatment of severe acute infections of the throat. One hundred and ninety patients were included in the study. There was a patchy or membranous exudate either on the tonsils or on islands of lymphoid tissue in the pharynx in every case. Cultures were not made. The patients were divided into three groups. In one group (15 patients) no sulfonamide compounds were given; in another group (25 patients) sulfonamide compounds were given after a period of observation; in a third group sulfonamide compounds were given early in the illness. Sulfathiazole and sulfanilamide were used. An initial dose of 30 grains (1.94 Gm.) was given, followed by sulfathiazole, 7.7 grains (0.49 Gm.), or sulfanilamide, 10 grains (0.65 Gm.), every four hours. As a result of their studies the authors conclude as follows:

In a series of 150 cases of severe acute tonsillitis and pharyngitis treated early with sulfonamides, the average duration of time lost was one-half that of a series of 40 cases which received sulfa treatment late or not at all.

Control of Hemorrhage.—McGovern [18] believes that infection is the paramount cause of secondary bleeding from the tonsillar fossae. He states that a reduction of the bacterial inflammation by the local use of a sulfonamide compound has yielded encouraging results in the prevention of such hemorrhages.

McGovern points out that various methods used in controlling secondary hemorrhages include blood transfusion, injection of the fossa with a local anesthetic and ephedrine solution and the local application of astringents and coagulants.

The gum used contains 3¼ grains (25 mg.) of sulfathiazole, and the author states that it

. . . is pleasant, practical, simple to administer and well tolerated by the patient; no untoward effects have been noted. The dosage is 1 to 2 tablets chewed for one-half to one hour four to six times a day, depending on the age and the weight of the patient.

The article is concluded as follows:

A preliminary study of the routine use of sulfathiazole gum after tonsillectomy indicated a reduction in the incidence of secondary hemorrhage. In addition, the gum appeared to exert a favorable effect on the healing of the pharyngeal wound.

17. Gettelman, E., and Kaiz, S. P.: The Treatment of Severe Tonsillitis in a Naval Dispensary, U. S. Nav. M. Bull. **42**: 399-402 (Feb.) 1944.

18. McGovern, F. H.: Prevention of Secondary Post-Tonsillectomy Hemorrhage with Sulfathiazole Gum, Arch. Otolaryng. **40**: 196-197 (Sept.) 1944.

Weille,[19] in discussing numerous problems of the otorhinolaryngologist, includes that of post-operative bleeding from the site of tonsillectomy or adenoidectomy. For post-tonsillectomy hemorrhage he advises removal of any grossly visible blood clot by the use of a suction apparatus or a tonsil sponge holder. A shrinking solution, such as 0.25 per cent aqueous neosynephrine hydrochloride, 1 or 2 per cent aqueous ephedrine hydrocholoride or 1:1,000 aqueous epinephrine hydrochloride, is then used on a tonsil sponge applied with gentle pressure to the bleeding area. This is followed by 20 per cent tannic acid in glycerin; a tonsil sponge is soaked in the solution and is held in the tonsillar fossa over the bleeding point for five minutes or more. If necessary, morphine is given preliminary to the aforementioned treatment. If the bleeding is not controlled, no. 000 plain catgut sutures may be inserted by means of a Henton needle hook. By taking small bites of tissue with the instrument, the bleeding is easily controlled. Preliminary anesthesia is obtained by spraying the throat with a 4 per cent solution of cocaine hydrochloride containing epinephrine hydrochloride 1:50,000. General anesthesia is not advised because of the risk of aspiration of blood clots. If the hemorrhage has been excessive, blood transfusions are advised. The control of post-adenoidectomy bleeding in general requires measures similar to those used in the control of post-tonsillectomy hemorrhage, but in addition a postnasal pack is occasionally necessary. The technic of placing the pack is described.

Since 1941 McLaurin[20] has used a solution of posterior pituitary of twice U. S. P. concentration for the control of hemorrhage following tonsillectomy and adenoidectomy. He advises against its use in patients who are suspected of having cardiac disease. Adults are given 5 minims (0.3 cc.) intramuscularly at fifteen minute intervals for three injections. To children 8 or 10 minims (0.5 or 0.6 cc.) is given, according to the size of the child. One half of the amount is given at the first injection, and twenty minutes later the remainder is administered. If any blood clots are present, they are gently removed with a ring forceps. The author has found the procedure satisfactory in the control of secondary hemorrhages.

19. Weille, F. L.: Treatment of the Common Ear, Nose, and Throat Problems by the General Practitioner, M. Clin. North America **28**: 1108-1128 (Sept.) 1944.

20. McLaurin, J. W.: Use of Solution of Posterior Pituitary of Twice U. S. P. Concentration for Hemorrhage Following Tonsillectomy and Adenoidectomy, Arch. Otolaryng. **39**: 536 (June) 1944.

ADENOIDS

Grant[21] briefly reviews the regional anato of the adenoidal area and reports a case primary postoperative bleeding from this that was not controlled by the usual procedu of removal of the clot and postnasal pa Finally the patient, a boy aged 6 years, was ta back to the operating room and careful ins tion showed that the source of bleeding located in a sulcus at the center of the noidal site. Again local pressure was tried, the bleeding recurred when the pressure released.

. . . Then hydrostatic pressure was used. With a needle about 20 cc. of physiological sodium chlo solution was forced into the mucous membranes a and at the side which ballooned the entire area toge All bleeding stopped instantly and there was no re rence. We were a little alarmed at what this balloo process might do if it extended into the larynx a word of caution should be used in this connection.

Clifford, Neuhauser and Ferguson[22] in cussing "adenoid bronchosinusitis" in infants children state that the disease develops as a c plication of an infection of the upper respira tract. A purulent discharge from the infe adenoid and the paranasal sinuses obstructs nasal passages and descends into the trachea bronchi; in time this discharge may penet the finer bronchi and set up a diffuse perib chial infection.

The disease is chronic in nature. Until advent of chemotherapy little help could afforded beyond general supportive measu Chemotherapy alone, however, has been di pointing. The experience of the authors du the past few years gives promise that a l proportion of these patients, in whom the mary etiologic factor is chronic infection hypertrophy of the adenoid tissue, may be c quickly by a combination of the use of sul amide compounds and surgical treatment.

The subject is discussed under the var headings of etiology, incidence, symptoms complications, diagnosis and treatment.

Hypertrophy and infection of the ade constitute the chief etiologic factor of the ease. The original infection has its incep during the months of September, October November. The patients range in age f 11 months to 8 years. These patients comp

21. Grant, H.: Hydrostatic Pressure in Ad Hemorrhage, Ann. Otol., Rhin. & Laryng. **53**: 57 (Sept.) 1944.

22. Clifford, S. H.; Neuhauser, E. B. D., and Fe son, C. F.: Adenoid Bronchosinusitis in Infants Children, M. Clin. North America **28**: 1091-1097 (S 1944.

persistent nasal obstruction and are subject mouth breathing and "snoring." There is to be profuse nasal discharge during the day, th postnasal drainage and paroxysms of cough- at night. The patients fail to gain or may e weight; they look poorly, are pale and igue easily. The diagnosis is established by adequate roentgen examination of the para- al sinuses and the nasopharynx, as well as ntgen and fluoroscopic examination of the st.

After the diagnosis is established, these pa- nts are given a three day course of sulfa- zine therapy. The dosage is from ¾ to 1 in (0.048 to 0.06 Gm.) per pound of body ight, with an equal number of grains of ium bicarbonate. During this period 2 to 3 nces (59 to 88.5 cc.) of fluids per pound of y weight is given every twenty-four hours. er this preliminary course of therapy has n given, the child's adenoids or tonsils are oved; in most cases both are removed. The ults following the procedures described are ally immediate and gratifying.

Ashbury,[23] over a five year period between 9 and 1943 inclusive, treated 157 patients h roentgen rays or gamma rays or both for removal of lymphoid tissue in the naso- rynx and the pharynx. The greatest incidence ases occurred in the first decade; approxi- ely one third of the patients were less than 15 rs of age. The youngest patient was 9 months; oldest was 78 years of age.

With regard to the symptoms for which they e treated, the patients fell into three main ses. In one group there were 27 patients, 17 per cent of the series, with demonstrable ring losses. Audiograms were obtained on e patients whenever possible. In a second up there were 51 patients, or 32 per cent, h lymphoid masses large enough to obstruct l respiration as evidenced by mouth breath- The remainder of the series had miscel- ous complaints, predominantly some form nfection of the upper respiratory tract, such haryngitis, tonsillitis, otitis media or sinusitis. s to the treatment of these patients, it was d by experience that the average patient d tolerate with no ill effects 800 to 1,200 roentgens administered to the tissues of the naso- pharynx and the pharynx within a period of four to five weeks; with this dosage the results were good, and more satisfactory for young children. In older children and adults the dose was not sufficient; for these patients an additional dose of 75 milligram hours was given by means of a radium applicator placed in the nasopharynx. The procedure of the treatments follows:

> . . . Within a period of twenty-nine days, the patient receives three pairs of roentgen-ray treatments, a radium treatment, and two more pairs of roentgen-ray treatments. Two treatments are given in the first week, and the remaining ones are administered at weekly intervals. In other words, the patient receives x-ray treatments on the first, fourth, eighth, twenty-second and twenty-ninth days and a radium application on the fifteenth day.

The author claims good results in destroying excessive lymphoid tissue, in the treatment of conductive deafness in children and in the treatment of respiratory obstruction and infection in children. Four case reports are given.

Hawley[24] reports treating 26 patients with roentgen rays for excessive lymphoid tissue in the nasopharynx. He states:

> The objective of roentgen-ray treatment is to deliver between 700 and 800 tissue roentgens to the tissues on each lateral wall of the nasopharynx, in divided doses, within eight days. Originally a dose of 600 tissue r was used, but failure was frequent and recurrence common. Since the dose has been raised to the present level, between 700 and 800 tissue r, the lymphoid tissue masses have disappeared in every case, and in only 2 out of 26 cases has there been a recurrence. . . .
>
> Eighteen of the patients had some impairment of hearing plus excess lymphoid tissue. The lymphoid tissue disappeared in every case, and in 17 there was improvement of hearing as measured by an audiometer. A change of less than 20 decibels was not regarded as significant. In only two instances did the hearing return to normal.

The author concludes his article with the following summary:

> Hypertrophied lymphoid tissue in the nasopharynx is a common cause of deafness. It may be successfully removed by irradiation with roentgen rays, as well as radium. If treatment is instituted before permanent changes have occurred in the ear, the hearing may return to normal.

434 Medical Arts Building.

Ashbury, H. H.: Radiation Therapy of Lymphoid e in the Nasopharynx and Pharynx, Radiology 50-253 (Sept.) 1944.

24. Hawley, S. J.: Roentgen Treatment of Lymphoid Tissue in the Nasopharynx, Radiology **43**: 254-255 (Sept.) 1944.

Correspondence

NATIONAL HEARING WEEK

To the Editor:—Years of practice as an otologist have convinced me that we have in the plight of the hard of hearing a concealed national tragedy. This experience and the conviction that we are on the threshold of great progress led me to accept the gratuitous position of chief executive of the American Society for the Hard of Hearing.

President Truman's endorsement of the observance of National Hearing Week beginning October 21 next is of great importance, for vast numbers of people, including a substantial percentage of your readers, having hearing defects. As we stand today, far reaching developments in electronics, speech reading and rehabilitation programs offer these people material assistance never before realized.

Will you please give such consideration and space to the copy of the President's letter and the enclosed statements as, in your opinion, their importance justifies?

Very sincerely,

C. STEWART NASH, M.D.,

President, American Society for the Hard of Hearing.

THE WHITE HOUSE

WASHINGTON

Dear Dr. Nash:

In this year of 1945 we have accomplished, through research, much on how to alleviate maladies and aid many hundreds of handicapped individuals.

Our Army, Navy and Veterans Administration have launched a very extensive program for rehabilitation and through the splendid efforts of the American Society for the Hard of Hearing, now celebrating its twenty-sixth anniversary, we shall gain tremendously in attaining victory for many who suffer the handicap of impaired hearing.

I have been pleased with the assurance that the splendid work being done by the American Society for the Hard of Hearing is known and appreciated by those agencies of the government whose concern is the alleviation of human suffering through the advancement of the art of healing. You and your associates are engaged in a work of the highest value, which deserves to succeed.

Each new achievement has brought into sharp re the work yet to be done and has been a spur to gre accomplishment. Consequently, I heartily endorse observance of National Hearing Week, beginn October twenty-first next.

Very sincerely yours,

HARRY S. TRUMA

Dr. C. Stewart Nash,
President,
American Society for the Hard of Hearing,
1537 35th Street, N. W.,
Washington, D. C.

COMMENT BY AMERICAN SOCIETY FOR TH HARD OF HEARING

President Truman's Hearing Week letter is a c lenge to nation-wide action, for with today's knowle and means, millions of citizens whose hearing has teriorated can be helped.

Never before was there so great an opportunit assist the hard of hearing. Our conservative estim show more than ten millions with some difficulty hearing in one or both ears; five millions have disab defects, often accompanied by psychologic frustra and more than one million school children urge need special acoustic attention. Among retur soldiers we shall have scores of thousands of casualties with which to deal.

Recent developments have given us new power help this vast army of the hard of hearing. Medi has new technics. Electronics in the last few y have made more progress than during the prev decades. Hearing aids have been improved, and cost has been lowered. Important also is the n sympathetic and understanding attitude toward hard of hearing which has been built by press and agencies.

Lipreading instruction has been greatly improved is more widely available. By the full use of the pr facilities, hundreds of thousands of the acoustic handicapped can be enabled to participate more and to contribute their full share; vast number school children can be saved from stunted develop and needless, lifelong tragedy.

Abstracts from Current Literature

Ear

NICILLIN IN OTOLOGY: ITS USE IN 511 CASES OF OTITIS MEDIA AND 74 CASES OF MASTOIDITIS. CHARLES H. ALLMAN, J. A. M. A. **129**:109 (Sept. 8) 1945.

Allman discusses the value of penicillin when used inst certain organisms, mentioning it as an antibiotic the greatest importance whether used locally, intra-cularly, intravenously, subcutaneously, intrathecally by a combination of these methods. He reviews the dings and the advice of others.

His preference is for giving 20,000 oxford units in an ial intramuscular injection, then 10,000 units every e hours thereafter day and night until the tympanic mbrane and the postaural incision are healed. He discourses fully on a tube that is used for instilling icillin into the antrum of the mastoid process. He phasizes that penicillin administered from the onset scarlet fever has reduced the incidence of aural com-ations.

There is a detailed discussion of the bacteriologic dings and the various cases in which penicillin was d are analyzed in tables.

The author summarizes as follows: "Penicillin was d intramuscularly in the treatment of 511 cases of rlet fever otitis media. It cured 27 cases of scarlet r mastoiditis without surgery. It was used intra-scularly and locally in 33 cases of scarlet fever toiditis requiring surgery, in 2 of which meningitis s present. It was administered by the same methods the postoperative treatment of 14 nonscarlet fever es of mastoiditis. Ten of these were acute and 4 e chronic. Penicillin kept the morbidity to a imum and there were no deaths."

GORDON, Philadelphia.

USAL RELATIONSHIP OF LYMPHOID TISSUE ABOUT EUSTACHIAN TUBES AND EAR PATHOLOGY. CASE REPORTS. EARL E. BAKER, Laryngoscope **55**:174 (April) 1945.

Baker has achieved success in 75 cases of pathologic olvement of the ear by removing adenoid tags and ue about the orifices of the eustachian tubes. Several he cases are described in detail. After removing the k of the adenoid tissue with the La Force Adenotome, breaks any remaining tissue away from the tubal fices with the forefinger.

HITSCHLER, Philadelphia.

RGERY OF THE FACIAL NERVE IN THREE HUNDRED OPERATED CASES. THOMAS G. TICKLE, Laryngo-scope **55**:191 (May) 1945.

The author prefers the direct line repair of the facial ve, using the anterior femoral cutaneous nerve for purpose.

The cases that respond to surgical treatment are those which the facial nerve has been injured, and cases so-called Bell's palsy. The nerve should be tested h faradic current; if there is any response whatever, operation should be performed, for the nerve will ain most of its function.

The nerve is located at the stylomastoid foramen and exposed from there to the site of injury. Small injuries may require merely decompression or, perhaps, the laying of a fresh nerve alongside the injured one. In greater injuries, the injured part is removed, the ends are freshened, and the fresh nerve is laid between. Sutures are not recommended. Gold leaf protects the nerve from the dressings and hold the nerve in place. The gold leaf may be removed as soon as the graft looks healthy and is partly covered with granulations, or it may be left for some time, as it does not act as a foreign body. The presence of infection does not seem to matter.

It is well to decompress the nerve in cases of Bell's palsy in which no response to faradic current is seen. It should be done soon, certainly within a few weeks' time.

If in cases of injury or of Bell's palsy there is no response to galvanic current, operation is not advised, for in these cases the muscles themselves have become atrophied.

If decompression has been done, there will be a return of function in a few months; if a graft has been used, in from six to nine months.

Galvanic massage of the facial muscles, a "hook" to brace the muscles, and reeducation help in the after-treatment.

HITSCHLER, Philadelphia.

ETIOLOGY OF EXTERNAL OTITIS. BEN H. SENTURIA, Laryngoscope **55**:277 (June) 1945.

From the point of view of etiology external otitis is not well understood. It occurs more frequently in the summer months, often after swimming. Some authors have considered that fungi are largely responsible for the condition. Senturia and others have not found this to be true but rather that in the largest percentage of cases, especially cases of acute disease, the otitis is of bacterial origin. A gram-negative bacillus, a species of Pseudomonas, particularly Bacillus pyocyaneus (Pseudomonas aeruginosa), was found in many infected ears and may often be the causative organism. No combination of organisms occurred frequently enough to warrant the conclusion that several bacteria together were responsible; in fact, in the majority of cases a single strain was recovered. The exception was the chronic eczematoid group, in which several bacteria with or without the addition of fungi appeared.

It was found that the discharge produced by the bacteria, including B. pyocyaneus, differed widely in color and consistency. Fungous infection, however, usually had its characteristic appearance.

HITSCHLER, Philadelphia.

IS THE FUNCTIONAL HEARING TEST BY MEANS OF A TUNING FORK SATISFACTORY? E. SCHLITTER, Pract. oto-rhino-laryng. **4**:318, 1942.

Schlitter compares hearing tests made with the tuning forks, the monochord and the audiometer. He believes that the results obtained with the tuning forks are comparable to those obtained with the audiometer. The audiometric curve cannot give a more accurate diagnosis of topical deafness; neither does it help in

evaluating the understanding of speech. Furthermore, the audiometric is not superior to the tuning fork test in the prescription of hearing aid appliances, since in both tests various models of hearing aids must be tried, for often there is an unexplained difference between the hearing curve and the results obtained with a hearing appliance which must be bridged by some individual variation of the hearing aid itself. However, audiometry is useful for scientific research, the examination of deaf-mutes and the control of therapeutic measures, particularly when more unity and improvement in both the method of examination and the apparatus have been achieved.

PERSKY, Philadelphia.

ACUTE ACOUSTIC TRAUMA. L. RUEDI and HANS MINDER, Pract. oto-rhino-laryng. **5**:169, 1943.

The authors present 8 soldiers who suffered acute rupture of the tympanic membrane during anti-aircraft fire. The traumatism occurred in spite of cotton wool protection. Subjectively there were tinnitus, increased intra-aural pressure, earache and moderate impairment of hearing. Objectively there were hemorrhage and occasional rupture of the tympanic membrane. The audiometric picture was similar in each case, in that there was a moderate loss of hearing throughout the entire tonal scale, with a pronounced drop from c^5 upward. The prognosis in general was good, and all recovered their normal hearing. The authors recommend the use of cotton wool ear plugs, which must close the auditory passage completely if damage to the ear is to be reduced.

PERSKY, Philadelphia.

OSTEOPSATHYROSIS AND OTOSCLEROSIS. E. HENSCHKE, Acta oto-laryng. orient. **1**:67, 1945.

Osteopsathyrosis means fragility of the bones. It is also known as fragilitas ossium. Henschke's patient was a man aged 37, who had been under medical care for some years. He complained of increasing deafness. Dizziness had not been noticed when the patient was first examined. There was a combination of blue scleras, osteopsathyrosis and otosclerosis—a syndrome described by van der Hoeve and de Kleyn in 1918. There had been several fractures (four or five) without trauma. The disease seems to be due to some deficiency in the number and in the function of osteoblasts. A table is set down showing observations of heredity in grandparents and siblings.

VOORHEES, New York.

Larynx

SURGICAL TREATMENT OF CANCER OF THE LARYNX. CHEVALIER L. JACKSON and CHARLES M. NORRIS, Laryngoscope **55**:196 (May) 1945.

Jackson and Norris state that "the treatment of cancer of the intrinsic larynx is by surgery or by some form of irradiation, or by a combination of these methods." Total and partial laryngectomy are used. Various forms of these operations and methods of irradiation are mentioned.

Laryngofissure and laryngectomy as practiced at the Temple University Clinic are described in detail. There are several illustrations. Postoperative care, complications and results are discussed.

HITSCHLER, Philadelphia.

Pharynx

CLINICAL OBSERVATIONS ON THE PALATINE TONSIL IN THE AGED. GEORGE KELEMEN, Ann. Otol., Rhin. Laryng. **54**:421 (June) 1945.

Kelemen carefully examined the tonsils in 309 patients who were evenly divided between the sexes. All ex... 9 of the patients were between 70 and 90 years of a... the 9 ranged from 90 to 103 years of age. He n... that there was a steady reduction in tonsillar size... these years but that complete disappearance was r... being less frequent than the presence of large, i... developed tonsils. Characteristic involuntary forms... the vertical narrow ridge, the large drop in the lo... pole, where the greatest part of the remnants are fo... and a small crater surrounding the last crypt. The t... sillar fossa is not involved in the involutionary chan... Acute tonsillitis or peritonsillitis was seen in only ... the 309 patients, but in these it took the same co... as in any other age group. It was noted that in ... sixth decade, at the beginning of senescence or ... threshold of "second childhood," there may be a sl... temporary increase of volume, which would corresp... to the increase generally noted in the first decade. ... was found, too, that regeneration occurs in the sev... decade, even after tonsillectomy has been perfor... Many difficulties in advanced age may be ascribe... the tonsils, and with recognition of the fact that ... tonsils are present even in the higher age groups, ... ventive geriatrics should include careful observatio... these organs, especially if the patient is at the thres... of the regressive years.

M. V. MILLER, Philadelphi...

RESIDUAL LYMPHATIC TISSUE IN THE TONSIL FOSSAE FOLLOWING TONSILLECTOMY. E. LUSH... Pract. oto-rhino-laryng. **5**:275, 1943.

At the thirtieth meeting of the Swiss Otorhinolar... gologic Society, held at Aarau, June 26 and 27, 1... Lusher discussed the role of residual lymphoid tissu... the tonsillar fossae. He made a survey of 224 pati... who were tonsillectomized. One year and more ... operation residual tissue was found in 104 pati... The site varied from the lower pole to the upper p... or small masses of tissue were studded throughout ... tonsillar fossae. In spite of the presence of this ... sidual tissue, 87 patients did not present any sympto... On the other hand, 17 had various symptoms, such ... pain, acute infection, peritonsillar abscess and focal ... fection.

The author considers the anatomic basis of the po... bility of residual tissue. Sometimes it is due to ... extension of the plica triangularis to the base of ... tongue, which may or may not have small masses ... lymphoid tissue enclosed in its folds. At other ti... there is a small amount of tissue in the upper pole ... was retained in the upper folds. Often small remn... of lymphoid tissue are carried deep into the capsule ... repeated tonsillar infections which produce second... scarring and fibrosis in this capsule, and lastly there ... be either breaks or so-called dehiscences in the cap... which permit an extension of lymphoid tissue into ... muscular beds. The relative merits of the Sluder meth... snaring and electrocoagulation for removal were eva... ated. The author believes that the Sluder techni... still the method of choice, although with this method ... with the use of the snare a careful inspection of ...

ssae must be made in the attempt to remove any sidual lymphoid tissue. On the other hand, he ques-ns the advisability of removing the plica triangularis, ce the latter affords a certain amount of lymphatic inage and prevents the dry pharyngitis which is seen casionally.

PERSKY, Philadelphia.

Nose

HINITIS VASOMOTORIA DUE TO IMBALANCE OF THE ENDOCRINE GLANDS. GEORGE R. LAUB, Laryngoscope **55**:179 (April) 1945.

There are some forms of vasomotor rhinitis that are dependent of season and the usual types of allergy. e symptoms and signs are similar to those of allergic initis.

There has been much in the literature concerning the lation between the nasal membranes and the endocrine nds. There is a definite relation between the sex nds and the nose. Vasomotor rhinitis may accom-ny the climacterium both in males and in females. sticular extract will markedly alleviate the condition the former, and ovarian extract in the latter.

It is also known that there are sometimes similar al symptoms accompanying adolescence, menstruation d pregnancy.

Laub discusses the calcium level and the parasym-hetic nervous system and their relationships to both nasal membrane and the endocrine glands. Other ssible glandular nasal relationships are mentioned.

In diagnosis, Laub emphasizes the need of a careful tory. Four cases are reported.

HITSCHLER, Philadelphia.

REWWORMS INFESTATION IN THE NASAL PASSAGES AND PARANASAL SINUSES. E. H. BROWN, Laryngoscope **55**:371 (July) 1945.

Screwworms, a pest of livestock, occasionally invade human nose and the paranasal sinuses. A review the literature is presented, and the life cycle of the rewworm is described. 'Severe general, as well as al, symptoms and signs will result from this infesta-n. If untreated, the worms will penetrate into the anial cavity, causing fatal meningitis. The treatment nsists of "irrigating the nose with 50 per cent chloro-rm or spraying with straight chloroform, and then moving the larvae with forceps or suction."

A case is reported.

HITSCHLER, Philadelphia.

NY ATRESIA OF THE CHOANA OF THE RIGHT NASAL FOSSA. L. LOPEZ VILLORIA, Arch. venezol. Soc. de oto-rino-laring., oftal., neurol. **5**:143, 1944.

Villoria describes a case of occlusion of the right al fossa in an 18 year old patient. The occluding ll was found to be hard bone and seemed to come wn from the anterior face of the sphenoid bone to posterior end of the hard palate. By means of a nd drill the author removed the entire bony wall and tablished a free communication into the nasopharynx. e convalescence was uneventful, and the result was finitely successful. In his discussion he emphasizes ny problems concerned with the interpretation of mptoms and difficulties of diagnosis.

PERSKY, Philadelphia.

MICROSCOPIC STUDY OF THE MUCOSA OF THE NOSE AND THE NASAL SINUSES IN INDIVIDUALS WHO HAVE SUFFERED SUDDEN OR VIOLENT DEATHS. PAULO DE QUEIROZ TELLES TIBIRICA, Rev. tribunais, São Paulo, Brazil, 1943.

The author made a microscopic investigation of the nasal and sinal mucosae of 40 persons who had died either suddenly or violently. While a clear-cut history of infection of the upper respiratory tract was absent in these cases, in most of them there were frank pathologic changes either in the nose or in the accessory sinuses. These changes were evidenced by marked thickening of the epithelial layer, in which the nuclei increased from the normal 5 or 6 in the nasal mucosa to 10 to 12 and from 2 or 3 in the sinal mucosa to 7 to 9. The author believes from his observations that the basilar membrane is not a normal structure but is in fact the result of chronic irritation. The tunica propria also presented changes suggestive of either acute or chronic inflammation. There was an infiltration of polymorphonuclear cells, as well as an increase in the number of fibroblasts; in the more chronic cases there were, in addition, evidences of fibrosis with involvement of the blood vessels and the glands and frequent occurrence of cysts. Changes in the periosteum and in the bone were also noted. Allergy was a factor in a number of cases, evidenced by thickening of the mucosa, increase in the size of the basilar membrane with frequent hyalinization, frequent occurrences of cysts and presence of eosinophils.

His conclusions are as follows: 1. The inhabitants of São Paulo show an inflammatory process of the nasal and sinal mucosa. 2. As a result of this inflammatory process, fibrosis is frequently observed. 3. Allergy is encountered in 20 per cent of the cases studied. 4. The Runge classification of rhinitis and sinusitis is uselessly complicated and should be substituted by that of the North American authors. 5. The basilar membrane of the nasal mucosa and the accessory sinuses is a pathologic structure and is not a normal membrane, as it has been previously considered. 6. There are frequent pathologic alterations of the bony structure of the nose and the accessory sinuses.

PERSKY, Philadelphia.

AN EXTENSIVE SARCOMA OF THE SINUSES. TIBOR V. BAJKAY, Pract. oto-rhino-laryng. **5**:83, 1943.

Bajkay reports a rare occurrence—sarcoma of the nose and adjacent sinuses. This tumor filled the maxillary cavity, extending upward to the lamina cribrosa and backward across the choana and back into the pharyngeal cavity. It filled the sphenoid and ethmoid sinuses, destroying their upper walls, and extended into the base of the brain. From the maxillary sinus it extended into the orbit. Complete exenteration of the tumor was possible, and it weighed 97 Gm. In addition to the surgical treatment, high voltage roentgen therapy was given the patient, and the patient made a complete surgical and symptomatic recovery.

PERSKY, Philadelphia.

Miscellaneous

ACUTE PYOGENIC OSTEOMYELITIS OF THE FACIAL BONES. GLENN J. GREENWOOD, Illinois M. J. **87**:302 (June) 1945.

Osteomyelitis of the maxillas is common, being about eighth in frequency among skeletal involvements. It occurs at all ages.

The blood supply of the superior maxilla springs, for the most part, from the trunk of the internal maxillary artery. The ethmoid, frontal and nasal branches arise from the ophthalmic artery, while the external maxillary artery springs from the external carotid artery. These vessels seldom function as end arteries. The blood supply of the inferior maxilla is more unique than that of the superior maxilla. The periosteal circulation in the inferior maxilla, unlike that in the superior maxilla, is abundant except over the upper part of the ramus and its processes, where the muscular arterial supply suffices. The potentialities for good involucrum formation are here.

Besides the usual sources of osteomyelitis incident to all bones there is dental infection, intimately associated with both maxillas, and in the superior maxilla, infection of the antrum of Highmore.

Odontogenous factors may be listed as dental caries, periapical abscesses, pyorrhea alveolaris and fractured teeth. Osteomyelitis here, as in the frontal bone group, may occur as a primary form, an extension form or a hematogenous form.

The extension form predominates in osteomyelitis of these bones. Extension takes place from any lesion of the overlying soft tissues, whose commuting vascular thrombi may invade the bony structure. Direct extension accrues from infection complicating any dental manipulation or surgical procedure which compromises the regional blood supply.

The hematogenous form is often difficult to distinguish from the extension form. If the teeth are intact and trauma is ruled out, one apparently may assume a hematogenous origin.

As to pathogenesis, osteomyelitis of the maxillas is no different from that occurring elsewhere. It happens thus: The anterior and posterior dental arteries, coursing respectively in front of and behind the antrum, anastomose in the alveolus, forming a closed arterial blood supply. Embarrassment of circulation here in the presence of the feeble periosteal vascular supply strangles circulation, resulting in sequestration of the impoverished alveolus along with its tooth structure. The more frequent involvement of the superior as compared with the inferior maxilla in this process may be explained on the basis of the larger size and more rigid construction of the superior maxilla, which is firmly attached to the skull. Thus, trauma is more poorly cushioned here.

The symptoms and signs of osteomyelitis of the jaws in general are derived from the regions involved, the associated lesions and the resultant complications, both local and general.

Locally the pain is boring, worse on reclining and greatest nocturnally. The relief accompanying cortical perforation is completed with periosteal escape of pus through soft tissue fistulas. In the loose facial subcutaneous tissue there is marked swelling.

When extension occurs medially from the body of the mandible, the mylohyoid muscle directs the pus. If extension is above the mandible, the swelling may simulate Ludwig's angina; if it is below the mandible the submaxillary triangle may contain it. If extension is in the ramus, the fascia of the internal pterygoid muscle may direct it medially into the mouth or laterally along the posterior free border. Trismus characterizes involvement of the pterygoid muscle.

Complications may further include suppurative maxillary sinusitis, orbital abscess or ankylosis of the temporomandibular joint, intracranial lesions, meningi abscess or encephalitis.

As to treatment of osteomyeltic lesions of the m ias, the author rather emphasizes conservatism states that when operative intervention is indicated should be boldly and efficiently instituted. One d well to wait until the virulence of the infection subsided.

That conservatism in the treatment of acute d alveolar lesions "pays off" is exemplified in repo from the literature.

ROBERT LEWY, Chicago

AN INTERBEHAVIORAL ANALYSIS OF SEVERAL ASPE OF STUTTERING. HARRIS HILL, J. Gen. Psych **32**:289, 1945.

This discussion places stuttering behavior in an int behavioral framework, the organism, with its histori backgrounds interacting with objects, conditions activities in a particular field, constituting the subj matter of such a study. The author believes that blocks manifested in stuttering are occasioned origin by direct stimulation, either by difficulty in pronunc tion or in finding words or by interruptions indu by affective and emotional reactions. Such blocks come substitute responses as conditioning develops. order to understand the learning of stuttering author inspects the attention, perception and consumm tory responses of the stutterer, the feelings and e tional behavior and the relationship to the per spoken to and the object spoken about.

POLLACK, Evanston, Il

OTOLARYNGOLOGIC SYMPTOMS OF THE PSYCHONEUROS F. W. DAVISON, Laryngoscope **55**: 52 (Feb.) 19

There have been few papers on the psychosom aspects of diseases of the ear, the nose or the thr Davison found that over half of his patients had least some psychoneurotic factor in their illnesses. the specialist gradually replaces the family physic he must more and more assume responsibility for psychic care of the patient.

The various psychoneurotic symptoms that lead patient to consult the otolaryngologist are listed discussed.

The cause of such symptoms is, generally speaki emotional disturbance. Treatment should not be di ted toward the symptom. Such treatment will tend to fix the symptom. It should rather be c cerned with elimination of the cause of the emoti disturbance.

A good list is given of both books and papers deal with psychosomatic medicine.

HITSCHLER, Philadelphia.

A CASE OF ACUTE CAVERNOUS SINUS THROMBOPH BITIS WITH STAPHYLOCOCCUS SEPTICEMIA—TREA WITH PENICILLIN RESULTING IN COMPLETE RECOV ALEX J. CONTE, Laryngoscope **55**:128 (March) 1

Conte briefly recounts the etiologic factors describes the pathogenesis of cavernous sinus thrombo He enumerates the findings that enable one to m a diagnosis. The prognosis has always been gr Several cures have been reported since the advent the sulfonamide compounds and penicillin. A cas reported in detail. Sulfadiazine and penicillin w

nistered. A complete recovery resulted. It is resting to note that no anticoagulants were used.

HITSCHLER, Philadelphia.

ATMENT OF LYE STRICTURE OF THE ESOPHAGUS. DAVID H. JONES, Laryngoscope **55**:133 (March) 945.

nes believes that the esophagus with lye burns is treated by early and frequent dilatation. This ld be done long before any apparent strictures have ed. This is in contrast to the older treatment, in ch dilatation was not employed until after strictures e present. A case is presented.

HITSCHLER, Philadelphia.

AMARTOMA OF TONGUE. CARL STAMM and ROBERT AUBER, Laryngoscope **55**:140 (March) 1945.

growth the size and shape of a small pea was vered arising from a baby's tongue. It interfered the baby's eating and was therefore removed. Its arance and the method of removal are described. ologically, there was an improper mixture of tissue ents covered with squamous epithelium. The tissues well differentiated and showed no proliferative ity. The lesion was therefore considered to repre- a malformation of tissue rather than a true tumor was classified as a hamartoma. Boyd defines artoma as "a developmental defect in tissue com- ion with a limited capacity for aberrant growth." is interesting to note that a comparatively small on a baby's tongue will interfere with swallow- An explanation is given. differential diagnosis is made.

HITSCHLER, Philadelphia.

ATMENT OF VINCENT'S ANGINA. CLARENCE PORTER ONES, Laryngoscope **55**:147 (March) 1945.

ncent's angina is probably due to multiple or mixed tion: the spirilla, the fusiform bacilli and various

the diagnosis, syphilis and granulocytopenia should uled out. A smear and cultures should be made. nce of spirilla or of fusiform bacilli from a smear not preclude their presence in the throat. Some e points in Jones' treatment follow. The lesion is ed and inspected, and a 2 per cent solution of a ne salt is applied. The blood is tested, and 0.45 of neoarsphenamine is injected intravenously. thiazole in the form of a gum or lozenges is used ly. Codeine, acetylsalicylic acid and vitamin C are internally. More neoarsphenamine is given if ovement is not rapid. Jones has had better and er results with this than with any other form of ment.

HITSCHLER, Philadelphia.

ICILLIN—CLINICAL USE IN OTOLARYNGOLOGY. J. INSTON FOWLKES, Laryngoscope **55**:155 (April) 945.

wlkes reviews the history, the chemistry and the n of penicillin. As the substance is probably only riostatic, its administration should be continued recovery is well established. In general, it works on the gram-positive bacteria, but the gram- tive meningococcus and Micrococcus catarrhalis are sensitive to it.

The drug is excreted quickly. It must therefore be given at frequent intervals, 10,000 to 20,000 units every three hours being the accepted dosage. Preoperative administration is desirable.

Sixty per cent of the drug is excreted by the kidneys in one hour; the remainder is mostly taken up by the liver, broken down and excreted in the bile. Some little is excreted in the saliva. None gets into the spinal fluid unless injected directly. The excretion there is slow; two doses a day are sufficient to maintain the proper concentration. The toxicity of the drug is low. The few toxic reactions encountered were not severe and disappeared soon after use of the drug was discontinued.

To illustrate the results obtained with the drug, 6 cases are given in detail.

HITSCHLER, Philadelphia.

SOME INDUSTRIAL HAZARDS IN OTOLARYNGOLOGY. SAMUEL L. FOX, Laryngoscope **55**:187 (April) 1945.

Patients with lacerations and avulsions should be treated both locally and internally with sulfonamide drugs. For local use, sulfanilamide is preferred because of its greater solubility. Minimal amounts, however, are recommended.

Wounds should be well cleaned. Alcohol precipitates the protein of cells, which then becomes a foreign body. This should be avoided. The smallest suture material should be used. Tetanus antitoxin should not be forgotten.

Thorough debridement of burns is necessary before further treatment is begun. Packing of the nostrils or of the external auditory meatuses will prevent them from closing after a severe burn.

Other industrial hazards include toxic labyrinthitis (from arsenic, for example), allergic sensitivity to various inhalants and chemicals, and laryngitis. Deafness may be caused by loud concussions (explosion deafness) or by long-continued exposure to loud noises. Both result in typical nerve deafness. Although properly fitted ear plugs help, the safest procedure is to transfer the person affected to a quieter environment.

HITSCHLER, Philadelphia.

PERORAL ENDOSCOPY: ITS AID TO CLINICAL DIAGNOSIS. DAVID IDE, New York State J. Med. **45**:1151 (July 15) 1945.

Working in the New York City Hospital, Ide has drawn definite conclusions concerning the value of endoscopy. In competent hands (there should be no other kind) it is an able aid in diagnosis. The surgeon studying the lung or the esophagus can decide the extent of involvement and the character, the kind and the scope of the proposed operation. The clinician is helped in cases in which diagnosis remains uncertain or in which roentgenologic reports vary in interpretation. Endoscopy is helpful in studying tuberculosis of the larynx in association with tuberculosis of the lungs. In pulmonary tuberculosis with pneumothorax, it helps rule out possible carcinoma; it may enable one to diagnose a latent tuberculous condition not previously suspected or at least not proved; it determines the presence of bronchogenic carcinoma, esophageal diverticulum or carcinoma of the esophagus. Case reports are cited in support of the value of direct examination by tube.

VOORHEES, New York.

SMOKING AND TUBERCULOSIS. HERBERT F. SCHWARTZ, New York State J. Med. **45**:1539 (July 15) 1945.

Schwartz is a specialist in the treatment of tuberculosis and works in the Pine Crest Sanatorium, in New York state. The present data are based on answers to a questionnaire which was sent to various directors of sanatoriums "throughout the country." He quotes Dr. C. W. Crampton to the effect that smokers have more colds than nonsmokers, their colds last longer, sinus involvement is more frequent, and there is often a persistent cough. Of the 50 directors who returned answers, only 2 per cent felt that smoking is not harmful; 16 per cent have a rule which forbids the practice. Most patients cannot be held down to this. They smoke openly or surreptitiously, holding the view that a much cherished habit of long standing is preferable to a benefit of remote and questionable value. The author states that "recent literature leads to the conclusion that smoking is harmful even to normal people; it is bound to have a deleterious effect upon the respiratory tract of individuals who are suffering from tuberculosis." It is assumed that a rule forbidding it might be enforced if the dangers inherent were carefully explained.

VOORHEES, New York.

EXOPHTHALMIC GOITER: ITS CONSERVATIVE TREATMENT. ISRAEL BRAM, New York State J. Med. **45**:1543 (July 15) 1945.

Bram states that goiter is "passing through a transitional stage . . . which may place it eventually in the field of internal medicine." The specific cause is still unknown. The cause does not reside in the thyroid gland. Thyroidectomy is a good palliative, but palliation is not cure. The incidence of postoperative progressive or malignant exophthalmos indicates that even now surgery seems to be contraindicated in a large percentage of cases. Thiouracil is a noteworthy addition to the armamentarium of the internist.

Concluding, the author states that conservative treatment combined with good cooperation of all concerned will aid in preventing chronic invalidism. Physical and psychic factors are important. Customary activities need not be entirely forbidden. The "patient can be restored to normal health and normal life expectancy without thyroidectomy." Treatment depends on remov of foci of infection and management by means of "re diet and drugs—quinine, iodine (in minute dos neostigmine, the barbiturates and thiouracil. The du tion of symptoms is from a few months to tw years. Discharge from active treatment can be atta within two to eighteen months. The average is ab seven and four-tenths months.

VOORHEES, New Yor

PECULIAR ASSOCIATION OF GENITAL MALFORMAT WITH DEFECT OF THE OLFACTORY BRAIN. B. GRU FELDER and W. LASCH, Acta oto-laryng. orient. 1 1945.

The authors discuss the relation between olfact and genital functions. They feel that in a cer number of cases there is a correlation of olfact defects and eunuchoidism. They cite the case o man 34 years old who committed suicide. He born with very small genital organs, bilateral cryp chidism and bilateral inguinal hernia. Puberty fa to appear. From the age of 5 years he had suff from hay fever and asthma, and his sense of s was underdeveloped. The autopsy record showed hy plasia of the penis, the scrotum and the testicles. Th was agenesis of the right portion of the prostate w hypoplasia of the left, as well as aplasia of the r kidney and absence of the right ureter. There agenesis of the left olfactory nerve with hypoplasi the right. The patient had a female build, with hair on the trunk. The distribution of the hair o the genital organs was distinctly of the female t The authors' impression is that this was a cas eunuchoidism associated with cryptorchidism and apl or remarkable hypoplasia of the olfactory nerves.

The authors have collected 12 cases, in 11 of wh hypoplasia or aplasia of the olfactory nerves was a ciated with malformation of the genital organs, and t conclude that in practically every case of congen defect of the olfactory part of the brain, hypoplasi the sex glands can be expected. Normal develop of the olfactory part of the brain does not, howe preclude the presence of genital malformation, includ hypoplasia of the sex glands.

PERSKY, Philadelphi

News and Comment

PLAQUE HONORING DR. HUGHSON

In honor of the late Dr. Walter Hughson, who for ...n years served as director of the otological research ...oratories of Abington Memorial Hospital, Abington, ...a., and as associate professor of otology in the Uni...rsity of Pennsylvania, a bronze plaque has been ...dicated and established at Deshon General Hospital, ...tler, Pa., it was announced today by Colonel C. J. ...ntzkow, M. C., commanding officer.

Simple ceremonies were held at Deshon on October ... Speakers were Colonel Norton Canfield, M. C., ...ief of otolaryngology and aural rehabilitation in the ...rgeon General's Office, who as a personal friend of ...r. Hughson paid tribute to his contributions to knowl...ge in his chosen field; Colonel Gentzkow, who gave ...e history of the plaque, and Major Edward H. Truex, ...C., chief of the aural rehabilitation service at Deshon, ...o gave a brief summary of Dr. Hughson's distin...ished career and of his connection with Deshon Gen...al Hospital.

Dr. Hughson died in September 1944. As early as ...42 he had formulated his concept of rehabilitation ... war casualties and had done a great deal of work ... the fitting of hearing aids on an objective basis.

About thirteen years ago Dr. Hughson noted signs ...d symptoms of disease in one ear and subsequently ...derwent an intracranial operation for the removal of ...tumor of the temporal bone. The tumor was deemed ... be malignant in character, but in spite of the poor ...gnosis Dr. Hughson lived for twelve years.

It was as a result of his own experience that his ...terest in otology was intensified to the point that, even ...ough he was a general surgeon, he turned the greater ...rt of his attention to study and research on otologic ...oblems. He was a lecturer at Temple University ...hool of Medicine, Philadelphia, a consultant of the ...ited States Public Health Service, a member of the board of directors of the Pennsylvania School for the Deaf and on the advisory council of Princeton University, from which he had been graduated in 1914. He received his degree in medicine from the Johns Hopkins University in 1918. He was a member of the Otological Society and of the Triological Society.

In the spring of 1943, when it became apparent that rehabilitation for the hard of hearing soldier would be necessary, Dr. Hughson, because of his extensive work and deep interest in otology, was consulted by the medical officers who eventually established the center at Deshon. He gave much valuable assistance and advice.

He visited Deshon General Hospital several times for the purpose of criticizing and advising on the work of the aural rehabilitation service. The methods now used at that hospital in the fitting of hearing aids basically represent additions to and refinements of the method originated by Dr. Hughson.

The plaque in memory of Dr. Hughson measures 12 by 15 inches and occupies a place of honor in the aural rehabilitation clinic at Deshon General Hospital. It carries the following inscription:

IN MEMORY OF
WALTER HUGHSON, M.D.
1891-1944
AND IN DEEP
APPRECIATION OF
THE ASSISTANCE HE
RENDERED IN THE
PLANNING OF
THIS CLINIC

This plaque was presented to the hospital through the courtesy of the American Rolling Mill Company, of Butler, Pa., and of the Nail City Bronze Company of Wheeling, W. Va.

Book Reviews

...philitic Deafness. By Dr. David Tieffenberg, ...associate to the chair of otolaryngology of the Faculty ...of Medical Sciences, Buenos Aires. Pp. 292, with ...8 illustrations. Buenos Aires: El Ateneo Press, 1944.

This book represents a comprehensive study of syph...ic deafness. The subject is considered first from the ...ndpoint of acquired syphilis with its involvement of ... external, middle and internal ears. Emphasis is ...ced on the involvement of the internal ear primarily, ...d an anatomicopathologic discussion of the lesions ...countered permits ready interpretation of the symp...ms and the subjective and the objective findings. The ...ncipal lesion is neurolabyrinthitis. The author ...empts to classify three types of deafness: 1. There ... a marked loss in perception of sounds in the upper ...e limits. 2. There is a loss in perception of sounds ...the lower tone and the upper tone limits but only a ...derate reduction in the middle register. However, he occasionally encounters a peculiar dip in the middle register. 3. There is a more or less generalized loss of hearing for all tones, and the audiometric picture closely resembles that seen in otosclerosis.

The second part of the book deals with congenital syphilis. The author follows the same general scheme of discussion and stresses the various findings in cases in this category. In summation he finds that the audiometric picture is, perhaps, a little more confused. While in many cases congenital syphilis follows more or less the same sequence as acquired syphilis, there are many types of syphilis which do not fall into one or the other group. Here are found many instances of profound deafness, even total deafness.

This work has been awarded first prize by the Faculty of Medicine. It is well written and illustrated with detailed reports of 100 cases with their audiograms and the subject has been thoroughly covered. The type is good and printed on good paper.

Directory of Otolaryngologic Societies *

NATIONAL

American Medical Association, Scientific Assembly, Section on Laryngology, Otology and Rhinology

Chairman: Dr. Louis H. Clerf, 1530 Locust St., Philadelphia.
Secretary: Dr. Fletcher D. Woodward, 104 E. Market St., Charlottesville, Va.
Place: San Francisco. Time: July 1-5, 1946.

American Academy of Ophthalmology and Otolaryngology

President: Dr. Gordon B. New, Mayo Clinic, Rochester, Minn.
President-Elect: Dr. Alan C. Woods, Johns Hopkins Hospital, Baltimore 5.
Executive Secretary-Treasurer: Dr. William L. Benedict, 100–1st Ave. Bldg., Rochester, Minn.

American Broncho-Esophagological Association

President: Dr. Carlos E. Pitkin, Carnegie Medical Bldg., Cleveland.
Secretary: Dr. Paul Holinger, 700 N. Michigan Ave., Chicago 11.
Place: Chicago. Time: May 31, 1946.

American Laryngological Association

President: Dr. Harold I. Lillie, Mayo Clinic, Rochester, Minn.
Secretary: Dr. Arthur W. Proetz, Beaumont Bldg., St. Louis.
Time: May 29-30, 1946.

* Secretaries of societies are requested to furnish the information necessary to keep this list up to date.

American Laryngological, Rhinological and Otological Society, Inc.

President: Dr. Albert C. Furstenberg, University Hospital, Ann Arbor, Mich.
Secretary: Dr. C. Stewart Nash, 708 Medical Arts Bldg., Rochester 7, N. Y.
Time: May 27-28, 1946.

SECTIONS:

Eastern.—Chairman: Dr. Oram R. Kline, 414 Cooper St., Camden, N. J.
Southern.—Chairman: Dr. Verling K. Hart, 106 W. 7th St., Charlotte, N. C.
Middle.—Chairman: Dr. Carl H. McCasky, 608 Guaranty Bldg., Indianapolis.
Western.—Chairman: Dr. Aubrey G. Rawlins, 384 Post St., San Francisco.

American Otological Society

President: Dr. Gordon Berry, 36 Pleasant St., Worcester, Mass.
Secretary: Dr. Isidore Friesner, 101 E. 73d St., New York.
Time: May 31-June 1, 1946.

American Otorhinologic Society for the Advancement of Plastic and Reconstructive Surgery, Inc.

President: Dr. Morris S. Bender, 121 E. 60th St., New York.
Secretary: Dr. Jacob Daley, 104 E. 40th St., New York 16.

INDEX TO VOLUME 42

The asterisk (*) preceding the page number indicates an original article in the Archives. Subject entries are made for all articles. Author entries are made for original articles and society transactions. Book Reviews and Society Transactions are indexed under these headings in their alphabetical order under the letters B and S, respectively.

Abnormalities and Deformities: See Harelip; and under names of organs and regions, as Genitals; etc.
Abscess: See also under names of organs and regions, as Brain; Nose; etc.
  penicillin in treatment of patients with deep infections of neck, *1
Acid, Acetylsalicylic: See Salicyl Compounds
Actinomycosis; Actinomyces in tonsils, *429
Adenohypophysis: See Pituitary Body
Adenoids and tonsils, *428
  relation of poliomyelitis to tonsillectomy and adenoidectomy, *431
Aeronautics: See Aviation and Aviators
Age, Old: See Old Age
Air, pressure; aero-otitis media and loss of auditory acuity in submarine escape training, *169
  pressure; causes of deafness in flyers, *21
  pressure; occupational deafness, with reference to chronic occupational deafness, *407
  pressure; physiologic effect to pressure changes with reference to otolaryngology, *110
Airplane: See Aviation and Aviators
Allergy: See Anaphylaxis and Allergy
Alonzo, J. M.: Laryngeal cancer, 155
Altmann, F.: Congenital deafness and cataract following rubella in mother, *51
  Labyrinthitis following purulent infection of middle ear; histopathologic studies, *93
  Slight operative injuries of stapes; histopathologic study of case, *42
American Board of Otolaryngology, 233
Amygdalectomy: See Tonsillectomy
Anaphylaxis and Allergy; hyperplastic sinopharyngostomatitis; manifestation of borderline allergy resulting in fetor ex oris, snoring and globus hystericus, *368
Anesthesia, grave reaction to locally applied tetracaine hydrochloride, *280
  pneumatology, 227
Anesthetics: See Anesthesia
Angina: See also Tonsils
  Ludwig's; deep cellulitis of face and neck, *415
  Ludwig's; penicillin in treatment of patients with deep infections of neck, *1
  Vincent's: See Fusospirochetosis
Ankylosis: See Ear, ossicles
Anomalies: See under names of organs and regions
Antrotomy: See Mastoid, surgery
Antrum: See Maxillary Sinus
Aphonia: See Voice
Apparatus: See also Instruments
  modified traction and fixation splint for fractures of facial bones, *53
Aquaeductus Cochleae: See Temporal Bone
Armed Forces Personnel: See Aviation and Aviators; Military Medicine; etc.
Armies: See Military Medicine
Art; introduction of artistic point of view in regard to rhinoplastic diagnosis, *33
Arteries: See Thrombosis; Vasomotor System; etc.
Arytenoidectomy: See Larynx
Aspergillus; otitis externa and its treatment, *123
Asphyxia; alterations in brain due to asphyxiation, 85
Atkinson, M.: Ménière's famous autopsy and its interpretation, *186
Atmosphere: See Air
Atopy: See Anaphylaxis and Allergy
Audiogram: See Hearing, tests
Audiometer: See Hearing, tests
Audition: See Hearing
Auditory Organ: See Ear
Autopsies; Ménière's famous autopsy and its interpretation, *186
Aviation and Aviators; causes of deafness in flyers, *21
Avitaminosis: See under Vitamins; and under names of deficiency diseases

Bacilli: See Bacteria
Bacteria: See also Staphylococci; Streptococci; etc.
  Diphtheria: See Diphtheria
  Fusiformis: See Fusospirochetosis
  Influenza: See Meningitis, influenzal
  otitic meningitis due to Bacillus proteus, jugular sinus thrombosis, septicemia due to Streptococcus viridans, thoracic and cardiac complications; recovery, 81
Barotrauma: See Air, pressure
Basedow's Disease: See Goiter, exophthalmic
Basilar Membrane: See Labyrinth
Beck, A. L.: Abscess of nasal septum complicating acute ethmoiditis, *275
Behavior, Children's: See under Children
  interbehavioral analysis of several aspects of stuttering, 440
Behnke, A. R.: Physiologic effect of pressure changes with reference to otolaryngology, *110
Bell's Paralysis: See Paralysis, facial
Berger, M. D.: Neoplasms of both maxillary sinuses, *397
Besnier-Boeck's Disease: See Sarcoidosis
Bismuth and Bismuth Compounds, Therapy: See Fusospirochetosis
Blast: See Explosions
Blonder, E. J.: Visualization of otitic abscess of brain, 304
Blood, coagulation; evalution of coagulation time, 226
  Diseases: See Leukemia; etc.
  purified gelatin solution as blood plasma substitute, 226
Boeck Sarcoid: See Sarcoidosis
Bones: See also under names of bones
  Conduction: See under Hearing
  Diseases: See Osteomyelitis
  Fractures: See Fractures
  fragility; osteopsathyrosis and otosclerosis, 438

Book Reviews:
  Cancer of Tongue; J. C. Oreggia, 152
  Doctors at War; edited by M. Fishbein, 233
  Syphilitic Deafness; D. Tieffenberg, 443

Brain, abscess, and meningitis due to pansinusitis, *47
  abscess; rupture of left temporosphenoidal brain abscess into ventricle, 301
  abscess; visualization of otitic abscess of brain, 304
  alterations due to asphyxiation, 85
  cavernous sinus thrombophlebitis; report of case with multiple cerebral infarcts and necrosis of pituitary body, 303
  peculiar association of genital malformation with defect of olfactory brain, 442
  temporal lobe syndrome following mastoidectomy, 305
Britain: See Great Britain
Bronchi, anatomy of, 154
Bronchoscopy as means of diagnosis and treatment, 153
Brunner, H.: Therapeutic value of iodized poppyseed oil 40 per cent in sinus infection, 88
Bullet Wounds: See Wounds
Burns, treatment of, 57
Burtoff, S. B.: Local use of sulfathiazole in mastoidectomy wounds; satisfactory results observed in 30 patients, *6

Cacioppo, L. T.: Meningitis and abscess of brain due to pansinusitis, *47
Caloric Test: See Labyrinth
Cancer: See Sarcoma; and under names of organs and regions, as Larynx; Maxillary Sinus; Sinuses, Nasal; Sphenoid Sinus; etc.
Cannon, P. H.: Nutritional aspects of resistance to infection, 84
Carcinoma: See under names of organs and regions
Cardiovascular System: See Heart; Vasomotor System
Carotid Canal: See Temporal Bone
Cartilage, device for cutting of cartilage isografts, *284
fracture-dislocations of cartilaginous nose; anatomicopathologic considerations and treatment, *131
neglected septal cartilage graft (with experimental observations on growth of human cartilage grafts), *384
Casteran, E.: Prophylaxis of hypoacusia, 153
Cataract and congenital deafness following rubella in mother, *51
Causalgia: See Neuralgia
Cavernous Sinus, Thrombosis: See under Thrombosis
Cellulitis: See under diseases, organs and regions, as Neck; etc.
Cerebrospinal Fever: See Meningitis
Cerebrospinal Fluid; treatment of rhinorrhea and otorrhea, 151
Cerebrum: See Brain
Chemotherapy: See under names of diseases and chemotherapeutic agents, as Mastoid; Meningitis; Otitis Media; Penicillin; Sulfonamides; etc.
Chest: See Thorax
Children: See also Infants; Schools
diagnosis and treatment of sinusitis in, 302
personality factors in motor speech delay case, 150
prophylaxis of hypoacusia, 153
recognition and palliative treatment of early sinus trouble in, 302
rehabilitation of child who is handicapped by deafness, 80
sinusitis in, *214
speech handicapped, 303
China and Chinese, practice of otolaryngology in China in peace and in war, 84
Choanae: See Nose
Choking; hyperplastic sinopharyngostomatitis; manifestation of borderline allergy resulting in fetor ex oris, snoring and globus hystericus, *368
Christoph, C.: Carcinoma of sphenoid sinus, 304
Cleft Palate: See Palate, cleft
Clerf, L. H.: Clinical significance of hoarseness, 228
Cochlea: See Hearing; Labyrinth
Communicable Diseases: See Meningitis; etc.
Concussion: See Explosions
Conjunctiva; relationship between bacteriology of conjunctiva and nasal mucosa, 226
Conley, J. J.: Treatment of chronic suppurative otitis media with penicillin, *374
Corti's Organ: See Labyrinth
Coryza: See Rhinitis
Cranium: See also Temporal Bone
complications, pulmonary, intracranial and general, of sinusitis, *216
importance of functional examination of eighth nerve in cases of intracranial tumor, 154
surgery of skull, *69
Crico-Arytenoid Joints: See under Larynx
Cysts: See under names of organs and regions

Daley, J.: Introduction of artistic point of view in regard to rhinoplastic diagnosis, *33
Deafness: See also Ear, diseases; Hearing; Otitis Media; Otosclerosis
acute acoustic trauma, 438
aero-otitis media and loss of auditory acuity in submarine escape training, *169
causes in flyers, *21
certain fundamental principles in prescribing and fitting hearing aids, 80
congenital, and cataract following rubella in mother, *51
effects of gun blasts on hearing, *164
its causes and what can be done about it, *144
Deafness—Continued
national hearing week, 436
occupational, with reference to chronic occupational deafness, *407
otologic research in Britain; notes on its progress, *91
prophylaxis of hypoacusia, 153
radiation therapy of lymphoid tissue in nasopharynx and pharynx, 151
rehabilitation of child who is handicapped by, 80
roentgen treatment of lymphoid tissue in nasopharynx, 151
vocational rehabilitation for deaf and hard of hearing, *157
with undeveloped mastoid and normal tympanic membrane, *174
Death; microscopic study of mucosa of nose and nasal sinuses in individuals who have suffered sudden or violent deaths, 439
Denegri, J.: Rhinoscleroma, 154
Dentition: See Teeth
Diathermy: See under names of diseases, organs and regions
Dingmann, A.: Congenital deafness and cataract following rubella in mother, *51
Diphtheria, nonvirulent, *412
Directory of otolaryngologic societies, 90, 156, 234, 308
Dislocations: See Nose
Diving; physiologic effect of pressure changes with reference to otolaryngology, *110
Dizziness: See Vertigo
Druss, J. G.: Aural manifestations of leukemia, *267
Ductless Glands: See Endocrine Glands
Dunlap, A. M.: Practice of otolaryngology in China in peace and in war, 84
Dysacusis: See Deafness
Dysphonia: See Voice
Dystocia: See Labor

Ear: See also Deafness; Hearing; Otorhinolaryngology; and under names of special structures, i. e., Labyrinth; Mastoid; etc.
aural manifestations of leukemia, *267
deafness with undeveloped mastoid and normal tympanic membrane, *174
discharge; treatment of rhinorrhea and otorrhea, 151
Diseases: See also Meningitis; Otitis Media; Otosclerosis; etc.
diseases; causal relationship of lymphoid tissue about eustachian tubes and ear pathology; case reports, 437
etiology of external otitis, 437
herpes zoster auris ("geniculate" ganglionitis); report of 8 cases with photographs of so-called syndrome of Ramsay Hunt, *309
Internal: See Labyrinth
Middle: See Otitis Media; Vertigo, aural
Murmurs: See Tinnitus
new otological views, 149
ossicles; histopathology of incus and head of malleus in cases of stapedial ankylosis, *339
ossicles; slight operative injuries of stapes; histopathologic study of case, *42
otitis externa and its treatment, *123
Sclerosis: See Otosclerosis
treatment of external otitis, *146
wounds in ear and mastoid region, 301
Edema: See under names of organs and regions
Electrocoagulation: See under names of diseases, organs and regions
Embolism: See Thrombosis
Embryology; development of cochlear aqueduct and round window membrane in human embryo, *239
Emphysema, mediastinal, 303
Endocrine Glands, rhinitis vasomotoria due to imbalance of, 439
Endoscopy: See also Bronchoscopy
peroral; its aid to clinical diagnosis, 441
Epidermis: See Skin
Epipharynx: See Nasopharynx
Epistaxis: See Nose, hemorrhage
Equen, M.: Magnetic aid in inserting esophageal string, *419
Equilibrium: See Labyrinth; etc.

Esophagus, magnetic aid in inserting esophageal string, *419
short, in infants, 227
treatment of lye stricture of, 441
tumors of, *426
Ethmoid Sinus: See also Sinuses, Nasal
abscess of nasal septum complicating acute ethmoiditis, *275
compound fracture involving orbit and frontal and ethmoid sinuses, *296
disease of frontal, ethmoid and sphenoid sinuses, *294
ossifying fibroma of ethmoid cells and frontal sinus, 306
Eustachian Tube; causal relationship of lymphoid tissue about eustachian tubes and ear pathology; case reports, 437
new otological views, 149
Exophthalmos: See Goiter, exophthalmic
Explosions; effects of gun blasts on hearing, *164
Eyes: See also Orbit
ocular complications of tumors of nasopharynx, *225

Face, Abnormalities: See Harelip
acute pyogenic osteomyelitis of facial bones, 439
Boeck's sarcoid involving face and larynx, *281
deep cellulitis of face and neck—Ludwig's angina, *415
modified traction and fixation splint for fractures of facial bones, *53
Paralysis: See Paralysis, facial
reconstructive treatment of gunshot wound of face and neck, *191
surgery of, *69
Factories: See Industry
Fenestration: See Otosclerosis
Fernandez Fernandez, C.: Importance of functional examination of eighth nerve in cases of intracranial tumor, 154
Fetor Ex Oris: See Halitosis
Fetus: See Embryology; Labor; Pregnancy
Fibroma, massive, of maxillary antrum as part of multiple neurofibromatosis in siblings, *208
ossifying, of ethmoid cells and frontal sinus, 306
Fiertz, C. O.: Prognosis of recurrent nerve paralysis following thyroidectomy; Laszlo-Fiertz test, *372
Fiertz-Laszlo Test: See Larynx, paralysis
Fissula Ante Fenestram: See Otosclerosis
Fitzhugh, W. M., Jr.: Atrophic rhinitis and ozena, *404
Foreign Bodies; maxillary sinusitis associated with dental and other infections with foreign body, *293
Foss, E. L.: Tumors of nose and throat, *421
Fossa, Mandibular: See Jaws
Fowler, E. P.: Early diagnosis and arrest of otosclerosis (clinical and histologic otosclerosis), *253
Fowler, E. P., Jr.: Causes of deafness in flyers, *21
Fox, N.: Hyperplastic sinopharyngostomatitis; manifestation of borderline allergy resulting in fetor ex oris, snoring and globus hystericus, *368
Fractures: See also under Frontal Sinus; Nose; etc.
modified traction and fixation splint for fractures of facial bones, *53
Fragilitas Ossium: See Bones, fragility
Frontal Sinus: See also Sinuses, Nasal
compound fracture involving orbit and frontal and ethmoid sinuses, *296
disease of frontal, ethmoid and sphenoid sinuses, *294
mucocele of, 302
ossifying fibroma of ethmoid cells and frontal sinus, 306
Fungi: See also Actinomycosis; Mycosis; etc.
etiology of external otitis, 437
Fusospirochetosis, treatment of Vincent's angina, 441
use of bismuth in treatment of Vincent's infection, 302

Gaines, T. R.: Penicillin in treatment of patients with deep infections of neck, *1
Galvanic Test: See Labyrinth
Ganglion, geniculate; herpes zoster auris ("geniculate" ganglionitis); report of 8 cases with photographs of so-called syndrome of Ramsay Hunt, *309
Gelatin; purified gelatin solution as blood plasma substitute, 226
Genitals; nasogenital relationship; review of literature, *235
peculiar association of genital malformation with defect of olfactory brain, 442
Geriatrics: See Old Age
German Measles: See Rubella
Globus Hystericus: See Choking
Goiter: See also Thyroid
exophthalmic; its conservative treatment, 442
Goldner, A.: Occupational deafness, with reference to chronic occupational deafness, *407
Goldstein, J.: Treatment of external otitis, *146
Grafts: See Cartilage; Skin
Graves's Disease: See Goiter, exophthalmic
Great Britain, otologic research in Britain; notes on its progress, *91
Griesman, B. L.: Structure of external nose; study from point of view of plastic surgery, *117
Grip: See Influenza
Gros, J. C.: Plasmocytoma of temporal bone, *188
Grove, W. E.: Injuries of internal ear, 84
Gunshot Wounds: See Wounds

Halitosis, hyperplastic sinopharyngostomatitis; manifestation of borderline allergy resulting in fetor ex oris, snoring and globus hystericus, *368
Hallpike, C. S.: Otologic research in Britain; notes on its progress, *91
Hamartoma of tongue, 441
Harelip and cleft palate, *67
Harkness, G. F.: Nonvirulent diphtheria, *412
Hatcher, M. B.: Penicillin in treatment of patients with deep infections of neck, *1
Hay Fever: See Anaphylaxis and Allergy; Rhinitis, vasomotor
Head: See Cranium
Noises: See Tinnitus
Headache: See also Migraine
diagnosis of mandibular joint neuralgia and its place in general head pain, 226
Hearing: See also Deafness
Aids: See Deafness
Conservation: See under Deafness
effects of gun blasts on, *164
national hearing week, 436
otologic research in Britain; notes on its progress, *91
testing auditory acuity in soldiers and assessing overall capacity for hearing of speech, 81
tests; comparative study of whisper tests and audiograms, 81
tests; is functional hearing test by means of tuning fork satisfactory? 437
tests; speech hearing tests, 225
tests; tests for unilateral deafness, *138
Heart, otitic meningitis due to Bacillus proteus, jugular sinus thrombosis, septicemia due to Streptococcus viridans, thoracic and cardiac complications; recovery, 81
Heine-Medin Disease: See Poliomyelitis
Hematology: See Blood; Hemopoietic System
Hemopoietic System; hematology, 82
Hemorrhage: See also Nose, hemorrhage; Pharynx; Tonsillectomy; etc.
purified gelatin solution as blood plasma substitute, 226
Herpes zoster auris ("geniculate" ganglionitis): report of 8 cases with photographs of so-called syndrome of Ramsay Hunt, *309
Hoarseness, clinical significance of, 228
Holt, T.: Grave reaction to locally applied tetracaine hydrochloride, *280
Hormones: See Endocrine Glands; etc.
Hughson, Walter, plaque honoring, 443
Hunt, M. K.: Hyperplastic sinopharyngostomatitis; manifestation of borderline allergy resulting in fetor ex oris, snoring and globus hystericus, *368
Hunt Syndrome: See Herpes zoster
Hypertrophy: See under names of organs and regions, as Thymus; etc.
Hypoacusia: See Deafness

Hypopharynx: See Larynx; Pharynx
Hypophysis: See Pituitary Body
Hypothyroidism: See under Thyroid

Immunity: See also Anaphylaxis and Allergy; etc.
nutritional aspects of resistance to infection, 84
Incus: See Ear, ossicles
Industry; occupational deafness, with reference to chronic occupational deafness, *407
prophylaxis of hypoacusia, 153
some industrial hazards in otolaryngology, 441
Infantile Paralysis: See Poliomyelitis
Infants: See also Children
penicillin therapy for thrombosis of cavernous sinus in 14 month old child, *147
Infarction: See under Brain
Infection: See Immunity; Wounds; and under names of bacteria, as Staphylococci; Streptococci; etc.
Influenza; treatment of influenzal meningitis with sulfadiazine, 226
Injuries: See under names of organs and regions, as Face; Head; Labyrinth; Nose; etc.
Instruments: See also Apparatus
device for cutting of cartilage isografts, *284
magnetic aid in inserting esophageal string, *419
Iodine and Iodine Compounds, Iodized Oil: See Sinuses, Nasal

Jackson, C. L.: Anatomy of bronchi, 154
Jaws, acute pyogenic osteomyelitis of facial bones, 439
diagnosis of mandibular joint neuralgia and its place in general head pain, 226
surgery of, *68
surgical treatment for dysfunction of temporomandibular joint, 82
Johnson, F.: Deafness with undeveloped mastoid and normal tympanic membrane, *174

Kesel, R. G.: Hyperplastic sinopharyngostomatitis; manifestation of borderline allergy resulting in fetor ex oris, snoring and globus hystericus, *368
Kimbrig, M.: Deep cellulitis of face and neck—Ludwig's angina, *415

Labia Vocalia: See Vocal Cords
Labor: See also Pregnancy; etc.
nasal injuries in dystocia, 150
Labyrinth: See also Vertigo, aural; etc.
development of cochlear aqueduct and round window membrane in human embryo, *239
Fenestration: See Otosclerosis
injuries of internal ear, 84
labyrinthitis following purulent infection of middle ear; histopathologic studies, *93
receptor apparatus of vestibulovasomotor reaction, *257
Labyrinthitis: See under Labyrinth
Language, specific meaning of certain terms indicating differing degrees or frequency, 83
Laryngectomy: See under Larynx
Laryngitis: See under Larynx
Laryngology: See Otorhinolaryngology
Larynx: See also Vocal Cords
Boeck's sarcoid involving face and larynx, *281
cancer, 155
cancer; surgical treatment, 438
carcinoma; significance of histopathologic study of serial sections; preliminary report, *178
paralysis; prognosis of recurrent nerve paralysis following thyroidectomy; Laszlo-Fiertz test, *372
review of available literature on larynx and laryngeal surgery for 1944, 150
stripping of vocal cords, *378
tumors of, *423
Laszlo, A. F.: Prognosis of recurrent nerve paralysis following thyroidectomy; Laszlo-Fiertz test, *372
Laszlo-Fiertz Test: See Larynx, paralysis
Lateral Sinus; roentgenographic diagnosis of complications of mastoiditis, 150
Thrombosis: See Thrombosis
Lempert, J.: Histopathology of incus and head of malleus in cases of stapedial ankylosis, *339
Lempert Operation: See Otosclerosis
Leukemia, aural manifestations of, *267
Lewin, M.: Reconstructive treatment of gunshot wound of face and neck, *191
Lewy, A.: Temporal lobe syndrome following mastoidectomy, 305
Lindsay, J. R.: Receptor apparatus of vestibulovasomotor reaction, *257
Lips: See also Harelip
tumors of lips and mouth, *421
Loré, J. M.: Stripping of vocal cords, *378
Lungs: See also Bronchi; Thorax; etc.
complications, pulmonary, intracranial and general, of sinusitis, *216
Lurie, M. H.: Deafness: its causes and what can be done about it, *144
Lye: See Esophagus
Lymphogranuloma, Schaumann's: See Sarcoidosis
Lymphoid Tissue: See Adenoids; Nasopharynx; Tonsils; etc.

Machle, W.: Effects of gun blasts on hearing, *164
Magnet; magnetic aid in inserting esophageal string, *419
Maliniac, J. W.: Fracture-dislocations of cartilaginous nose; anatomicopathologic considerations and treatment, *131
Malleus: See Ear, ossicles
Mandible: See Jaws
Mastoid, deafness with undeveloped mastoid and normal tympanic membrane, *174
Inflammation: See Mastoiditis
postoperative mastoid process, 153
surgery; local use of sulfathiazole in mastoidectomy wounds; satisfactory results observed in 30 patients, *6
surgery; slight operative injuries of stapes; histopathologic study of case, *42
surgery; temporal lobe syndrome following mastoidectomy, 305
wounds in ear and mastoid region, 301
Mastoidectomy: See Mastoid, surgery
Mastoiditis: See also Otitis Media
penicillin in otology; its use in 511 cases of otitis media and 74 cases of mastoiditis, 437
penicillin therapy of, *330
roentgenographic diagnosis of complications of, 150
Mattos Barretto, P.: Bronchoscopy as means of diagnosis and treatment, 153
Maxilla: See Jaws
Maxillary Bone: See Jaws
Maxillary Sinus: See also Sinuses, Nasal
irrigation by way of middle meatus, 231
massive fibroma of maxillary antrum as part of multiple neurofibromatosis in siblings, *208
maxillary sinusitis associated with dental and other infections with foreign body, *293
neoplasms of both maxillary sinuses, *397
Measles, German: See Rubella
Mediastinum, Emphysema: See Emphysema
Medicine, Aviation: See Aviation and Aviators
Military: See Military Medicine
Tropical: See Tropical Medicine
Medin-Heine Disease: See Poliomyelitis
Membrane, Tympanic: See under Ear
Ménière's famous autopsy and its interpretation, *186
Ménière's Disease: See Vertigo, Aural
Meningitis and abscess of brain due to pansinusitis, *47
influenzal; treatment with sulfadiazine, 226
otitic, due to Bacillus proteus, jugular sinus thrombosis, septicemia due to Streptococcus viridans, thoracic and cardiac complications; recovery, 81
Meningococci: See under Meningitis
Mental Diseases: See Neuroses and Psychoneuroses; etc.
Migraine, hereditary familial telangiectasis with epistaxis and migraine, 82
Military Medicine: See also Aviation and Aviators; etc.
acute acoustic trauma, 438
effects of gun blasts on hearing, *164
testing auditory acuity in soldiers and assessing overall capacity for hearing of speech, 81
tests for unilateral deafness, *138
Molds: See Fungi
Motion Sickness: See Movements
Mouth: See also Stomatitis
tumors of lips and mouth, *421

Movements; receptor apparatus of vestibulovasomotor reaction, *257
Mucocele: See Frontal Sinus
Mucous Membrane: See Mouth; Nose; etc.
Muscles, Paralysis: See Paralysis
Mycosis: See also Actinomycosis; etc.
treatment of external otitis, *146
Myiasis; screw worms infestation in nasal passages and paranasal sinuses, 439

Narcosis: See Anesthesia
Nares: See Nose
Nasal Sinuses: See Sinuses, Nasal
Nash, C S., communication regarding national hearing week, 436
Nasopharynx; causal relationship of lymphoid tissue about eustachian tubes and ear pathology; case reports, 437
radiation therapy of lymphoid tissue in nasopharynx and pharynx, 151
roentgen treatment of lymphoid tissue in, 151
tumors, *423
tumors, diagnosis of, 302
tumors, ocular complications of, 225
Neck, deep cellulitis of face and neck—Ludwig's angina, *415
penicillin in treatment of patients with deep infections of, *1
penicillin therapy of superficial and deep cellulitis and cervical abscess, *335
reconstructive treatment of gunshot wound of face and neck, *191
Necropsies: See Autopsies
Neivert, H.: Late secondary tonsillar hemorrhage; studies of prothrombin and vitamin K, *14
Neoplasms: See Sarcoma; and under names of organs and regions
Nerves: See also Neuralgia; Paralysis
facial, repair of peripheral injuries of, 225
facial, surgery in 300 operated cases, 437
importance of eighth nerve in cases of intracranial tumor, 154
Paralysis: See under Paralysis
Recurrent: See Larynx, paralysis
Nervous System: See Brain; Nerves; etc.
Diseases: See Neuroses and Psychoneuroses; etc.
Neuralgia; diagnosis of mandibular joint neuralgia and its place in general head pain, 226
Neurofibromatosis; massive fibroma of maxillary antrum as part of multiple neurofibromatosis in siblings, *208
Neuroses and Psychoneuroses; otolaryngologic symptoms of psychoneuroses, 440
New, G. B.: Tumors of nose and throat, *421
Noise, causes of deafness in flyers, *21
effects of gun blasts on hearing, *164
occupational deafness, with reference to chronic occupational deafness, *407
Nose: See also Nasopharynx; Otorhinolaryngology; Smell; etc.
abscess of nasal septum complicating acute ethmoiditis, *275
Accessory Sinuses: See Sinuses, Nasal
bony atresia of choana of right nasal fossa, 439
discharge; treatment of rhinorrhea and otorrhea, 151
fracture-dislocations of cartilaginous nose; anatomicopathologic considerations and treatment, *131
hemorrhage; hereditary familial telangiectasis with epistaxis and migraine, 82
hyperplastic sinopharyngostomatitis; manifestation of borderline allergy resulting in fetor ex oris, snoring and globus hystericus, *368
Inflammation: See Rhinitis
injuries in dystocia, 150
introduction of artistic point of view in regard to rhinoplastic diagnosis, *33
microscopic study of mucosa of nose and nasal sinuses in individuals who have suffered sudden or violent deaths, 439
nasogenital relationship; review of literature, *235
neglected septal cartilage graft (with experimental observations on growth of human cartilage grafts), *384
relationship between bacteriology of conjunctiva and nasal mucosa, 226
rhinoscleroma, 154
Nose—Continued
screw worms infestation in nasal passages and paranasal sinuses, 439
structure of external nose; study from point of view of plastic surgery, *117
surgery of, *63
tumors of nose and throat, *421
use and abuse of nasal vasoconstrictor medications, 81
Nutrition: See also Vitamins; etc.
diagnosis and treatment of nonsuppurative sinusitis, *198
nutritional aspects of resistance to infection, 84
Nystagmus: See Labyrinth
Caloric: See Labyrinth

Occupations: See Industry
Oil, Iodized: See Sinuses, Nasal
Old Age; clinical observations on palatine tonsil in aged, 438
Olfactory Tract: See Brain
O'Neill, H.: Herpes zoster auris ("geniculate" ganglionitis); report of 8 cases with photographs of so-called syndrome of Ramsay Hunt, *309
Oppenheimer, M. J.: Receptor apparatus of vestibulovasomotor reaction, *257
Orbit, complications of sinusitis, *217
compound fracture involving orbit and frontal and ethmoid sinuses, *296
Organ of Corti: See Labyrinth
Oropharynx: See Pharynx
Osler's Disease: See Telangiectasia
Osteogenesis Imperfecta: See Bones, fragility
Osteomyelitis, *218
acute pyogenic, of facial bones, 439
Osteopsathyrosis: See Bones, fragility
Otitis Externa: See Ear
Otitis Media: See also Mastoiditis
acute, penicillin therapy of, *330
aero-otitis media and loss of auditory acuity in submarine escape training, *169
causes of deafness in flyers, *21
chronic suppurative; penicillin therapy, *334
chronic suppurative, treatment, *374
chronic suppurative; treatment by local application of penicillin and other drugs, 149
labyrinthitis following purulent infection of middle ear; histopathologic studies, *93
otitic meningitis due to Bacillus proteus, jugular sinus thrombosis, septicemia due to Streptococcus viridans, thoracic and cardiac complications; recovery, 81
penicillin in otology; its use in 511 cases of otitis media and 74 cases of mastoiditis, 437
visualization of otitic abscess of brain, 304
Oto-Audion: See Hearing, tests
Otolaryngologic societies, directory of, 90, 156, 234, 309, 444
Otolaryngology: See also Otorhinolaryngology
American Board of, 233
physiologic effect of pressure changes with reference to, *110
practice in China in peace and in war, 84
Otology: See also Otorhinolaryngology
otologic research in Britain; notes on its progress, *91
Otorhinolaryngology: See also Otolaryngology; Otology
evaluation of coagulation time, 226
otolaryngologic symptoms of psychoneuroses, 440
penicillin; clinical use in otolaryngology, 441
penicillin therapy in practice of otolaryngology, *327
review of tuberculosis, 226
some industrial hazards in otolaryngology, 441
use of penicillin in otorhinologic infections; report of 5 cases with recovery, 151
vitamins and eye, ear, nose and throat, 82
Otorrhea: See Ear, discharge
Otosclerosis and osteopsathyrosis, 438
critical review of fenestration operation; report of cases, 301
early diagnosis and arrest (clinical and histologic otosclerosis), *253
histopathology of incus and head of malleus in cases of stapedial ankylosis, *339
Ozena: See Rhinitis, atrophic

Palate, cleft, and harelip, *67
Palsy: See Paralysis
Pansinusitis: See Sinuses, Nasal
Paralysis: See also Larynx, paralysis; Poliomyelitis; etc.
facial; herpes zoster auris ("geniculate" ganglionitis); report of 8 cases with photographs of so-called syndrome of Ramsay Hunt, *309
facial; surgery of facial nerve in 300 operated cases, 437
Infantile: See Poliomyelitis
Recurrent: See Larynx, paralysis
Parietal Lobe: See Brain
Patch Test: See Anaphylaxis and Allergy
Peer, L. A.: Contributions to plastic surgery during 1944, *56
Neglected septal cartilage graft (with experimental observations on growth of human cartilage grafts),*384
Penicillin; clinical use in otolaryngology, 441
Therapy: See Mastoiditis; Meningitis; Neck; Otitis Media; Otorhinolaryngology; Sinuses, Nasal; Thrombosis; etc.
Personality factors in motor speech delay case, *150
Petrositis: See Temporal Bone
Petrous Bone: See Temporal Bone
Pfeiffer's Bacillus: See Influenza
Pharyngitis: See under Pharynx
Pharynx: See also Nasopharynx
abscesses of pyriform sinus, 301
hyperplastic sinopharyngostomatitis; manifestation of borderline allergy resulting in fetor ex oris, snoring and globus hystericus, *368
massive hemorrhages; report of case, 84
penicillin therapy of acute pharyngitis, *329
Phonation: See Speech; Voice
Phonetics: See under Speech
Pituitary Body; cavernous sinus thrombophlebitis; report of case with multiple cerebral infarcts and necrosis of pituitary body, 303
Plasmocytoma of temporal bone, *188
Plastic Surgery, contributions during 1944, *56
device for cutting of cartilage isografts, *284
introduction of artistic point of view in regard to rhinoplastic diagnosis, *33
neglected septal cartilage graft (with experimental observations on growth of human cartilage grafts), *384
reconstructive treatment of gunshot wound of face and neck, *191
structure of external nose; study from point of view of plastic surgery, *117
Plaut-Vincent's Infection: See Fusospirochetosis
Pneumatology: See Anesthesia; Resuscitation
Poisons and Poisoning: See also under names of specific substances
occupational deafness, with reference to chronic occupational deafness, *407
Poliomyelitis, relation to tonsillectomy and adenoidectomy, *431
Postmortems: See Autopsies
Pregnancy, congenital deafness and cataract following rubella in mother, *51
Presbycusis: See Deafness
Priest, R. E.: Tests for unilateral deafness, *138
Prostheses: See Plastic Surgery
Prothrombin; acetylsalicylic acid, probable cause for secondary post-tonsillectomy hemorrhage; preliminary report, *19
late secondary tonsillar hemorrhage; studies of prothrombin and vitamin K, *14
Psychoneuroses: See Neuroses and Psychoneuroses
Psychoses: See Neuroses and Psychoneuroses; etc.

Radiations: See under names of various organs and diseases
Recklinghausen's Disease: See Neurofibromatosis
Reflex, receptor apparatus of vestibulovasomotor reaction, *257
Rehabilitation, vocational, for deaf and hard of hearing, *157
Rendu-Osler's Disease: See Telangiectasia
Respiratory Tract: See Bronchi; Nasopharynx; Nose; Pharynx; etc.
Resuscitation; pneumatology, 227
Rhinitis, atrophic, and ozena, *404
use and abuse of nasal vasoconstrictor medications, 81
vasomotor, due to imbalance of endocrine glands, 439
Rhinology: See Otorhinolaryngology
Rhinoplasty: See under Nose
Rhinorrhea: See Nose, discharge
Rhinoscleroma, 154
Riesco, M. C.: Importance of functional examination of eighth nerve in cases of intracranial tumor, 154
Roberts, S. E.: Diagnosis and treatment of nonsuppurative sinusitis, *198
Roentgen Rays, Therapy: See Nasopharynx; Sinuses, Nasal; Thymus
Rosedale, R. S.: Boeck's sarcoid involving face and larynx, *281
Massive fibroma of maxillary antrum as part of multiple neurofibromatosis in siblings, *208
Nasogenital relationship; review of literature, *235
Rosen, S.: Thrombosis of lateral sinus with metastasis; penicillin therapy; recovery, *417
Round Window: See under Labyrinth
Rubella; congenital deafness and cataract following rubella in mother, *51

Salicyl Compounds; acetylsalicylic acid, probable cause for secondary post-tonsillectomy hemorrhage; preliminary report, *19
late secondary tonsillar hemorrhage; studies of prothrombin and vitamin K, *14
Salinger, S.: Paranasal sinuses, *212, *285
Sarcoidosis; Boeck's sarcoid involving face and larynx, *281
Sarcoma: See also under names of organs and regions
extensive, of sinuses, 439
Scala Tympani: See Labyrinth
Schools, speech handicapped, 303
Scleroma: See Rhinoscleroma
Screw Worms: See Myiasis
Segura, E. V.: Prophylaxis of hypoacusia, 153
Semicircular Canal: See Labyrinth
Senility: See Old Age
Septicemia: See under specific organisms, as Staphylococci; Streptococci; etc.
Septum, Nasal: See under Nose
Shilling, C. W.: Aero-otitis media and loss of auditory acuity in submarine escape training, *169
Shock, purified gelatin solution as blood plasma substitute, 226
treatment of, *57
Sigmoid Sinus: See Lateral Sinus
Thrombosis: See Thrombosis
Simon, E.: Otitis externa and its treatment, *123
Singer, R.: Acetylsalicylic acid, probable cause for secondary post-tonsillectomy hemorrhage; preliminary report, *19
Singleton, J. D.: Tonsils and adenoids, *428
Sinus, Ethmoid: See Ethmoid Sinus
Frontal: See Frontal Sinus
Lateral: See Lateral Sinus
Maxillary: See Maxillary Sinus
Nasal: See Sinuses, Nasal
Piriform: See under Pharynx
Sigmoid: See Lateral Sinus
Sphenoid: See Sphenoid Sinus
Thrombosis: See under Thrombosis
Sinuses, Nasal: See also Ethmoid Sinus; Frontal Sinus; Maxillary Sinus; Sphenoid Sinus; etc.
complications, pulmonary, intracranial and general, of sinusitis, *216
diagnosis and treatment of nonsuppurative sinusitis, *198
diagnosis and treatment of sinusitis in children, 302
does sinus infection affect sinus growth? 225
extensive sarcoma of sinuses, 439
irrigation by displacement, *290
malignant tumor, *221
meningitis and abscess of brain due to pansinusitis, *47
microscopic study of mucosa of nose and nasal sinuses in individuals who have suffered sudden or violent deaths, 439
nonmalignant tumors, *222
orbital complications of sinusitis, 217

Sinuses, Nasal—Continued
paranasal sinuses, *212, *285
penicillin treatment of, *328
physiologic effect of pressure changes with reference to otolaryngology, *110
recognition and palliative treatment of early sinus trouble in children, 302
roentgen therapy of sinusitis, *291
screw worms infestation in nasal passages and paranasal sinuses, 439
sinusitis in children, *214
surgical procedures, *285
therapeutic value of iodized poppyseed oil 40 per cent in sinus infection, 88
tumors of nose and accessory sinuses, *421
vaccine and drug therapy of sinusitis, *287
Skeleton: See Bones
Skin, grafting, *59
Skull: See Cranium
Smell, peculiar association of genital malformation with defect of olfactory brain, 442
Smoking: See Tobacco
Snitman, M. F.: Carcinoma of larynx; significance of histopathologic study of serial sections; preliminary report, *178
Snoring; hyperplastic sinopharyngostomatitis; manifestation of borderline allergy resulting in fetor ex oris, snoring and globus hystericus, *368
Societies, American Academy of Ophthalmology and Otolaryngology, 83
national, directory of, 90, 156, 234, 308, 444
otolaryngologic, directory of, 90, 156, 234, 308, 444
Society Transactions:
Chicago Laryngological and Otological Society, 84, 228, 304
Second South American Congress of Otorhinolaryngology, 153
Sounds: See Noise
Speech: See also Voice
anomalies of speech mechanism and associated voice and speech disorders, 227
do you know someone who stutters? 303
handicapped, 303
hearing tests, 225
interbehavioral analysis of several aspects of stuttering, 440
personality factors in motor speech delay case, 150
Sphenoid Sinus: See also Sinuses, Nasal
carcinoma of, 304
disease of frontal, ethmoid and sphenoid sinuses, *294
Spiegel, E. A.: Receptor apparatus of vestibulovasomotor reaction, *257
Spinal Fluid: See Cerebrospinal Fluid
Splints; modified traction and fixation splint for fractures of facial bones, *53
Squamitis: See under Temporal Bone
Stagman, J.: Device for cutting of cartilage isografts, *284
Stammering: See under Speech
Stapes: See Ear, ossicles
Staphylococci, case of acute cavernous sinus thrombophlebitis with staphylococcus septicemia treated with penicillin resulting in complete recovery, 440
septicemia, *430
Stomatitis; hyperplastic sinopharyngostomatitis; manifestation of borderline allergy resulting in fetor ex oris, snoring and globus hystericus, *368
Streptococci, labyrinthitis following purulent infection of middle ear; histopathologic studies, *93
otitic meningitis due to Bacillus proteus, jugular sinus thrombosis, septicemia due to Streptococcus viridans, thoracic and cardiac complications; recovery, 81
Stria Vascularis: See Labyrinth
Struble, G. C.: Penicillin therapy in practice of otolaryngology, *327
Stuttering: See under Speech
Submarines; aero-otitis media and loss of auditory acuity in submarine escape training, *169
Sulfathiazole: See Mastoid, surgery
Sulfonamides and other antibacterial agents, *56
Therapy: See Mastoid, surgery; Meningitis; etc.
Surgery: See Apparatus; Instruments; Wounds
Plastic: See Plastic Surgery
Syphilis: See under names of organs and regions

Teeth, maxillary sinusitis associated with dental and other infections with foreign body, *293
Telangiectasia, hereditary familial, with epistaxis and migraine, 82
Temporal Bone; new otological views, 149
penicillin therapy of acute petrositis, *330
plasmocytoma of, *188
Temporomandibular Joint: See Jaws
Tetracaine: See Anesthesia
Thorax: See also Heart; Lungs; etc.
otitic meningitis due to Bacillus proteus, jugular sinus thrombosis, septicemia due to Streptococcus viridans, thoracic and cardiac complications; recovery, 81
Thrombosis, case of acute cavernous sinus thrombophlebitis with staphylococcus septicemia treated with penicillin resulting in complete recovery, 440
cavernous sinus thrombophlebitis; report of case with multiple cerebral infarcts and necrosis of pituitary body, 303
of lateral sinus with metastasis; penicillin therapy; recovery, *417
otitic meningitis due to Bacillus proteus, jugular sinus thrombosis, septicemia due to Streptococcus viridans, thoracic and cardiac complications; recovery, 81
penicillin therapy for thrombosis of cavernous sinus in 14 month old child, *147
Thymus, hypertrophy, 152
hypertrophy; roentgenographic diagnosis and treatment, 227
Thyroid: See also Goiter
prognosis of recurrent nerve paralysis following thyroidectomy; Laszlo-Fiertz test, *372
Thyroidectomy: See under Thyroid
Tic Douloureux: See Neuralgia
Throat: See also Larynx; Otorhinolaryngology; Pharynx; Tonsils; etc.
tumors of nose and throat, *421
Thrombophlebitis, Sinus: See under Thrombosis
Tinnitus aurium; observations on its nature and control, 80
Tissue, carcinoma of larynx; significance of histopathologic study of serial sections; preliminary report, *178
Tobacco; smoking and tuberculosis, 442
Tongue, hamartoma of, 441
Tonsillectomy, acetylsalicylic acid, probable cause for secondary post-tonsillectomy hemorrhage; preliminary report, *19
control of hemorrhage, *433
late secondary tonsillar hemorrhage; studies of prothrombin and vitamin K, *14
relation of poliomyelitis to tonsillectomy and adenoidectomy, *431
residual lymphatic tissue in tonsillar fossae following, 438
Tonsillitis: See under Tonsils
Tonsils, Actinomyces in, *429
and adenoids, *428
clinical observations on palatine tonsil in aged, 438
latent tuberculosis of, 150
Pharyngeal: See Adenoids
residual lymphatic tissue in tonsillar fossae following tonsillectomy, 438
sulfonamide compounds in treatment of acute tonsillitis, *432
Ulcer: See Fusospirochetosis
Trachea, tumors of, *425
Traction: See Splints
Transplantation: See under Cartilage; Skin
Trench Mouth: See Fusospirochetosis
Tropical Medicine; otitis externa and its treatment, *123
treatment of external otitis, *146
Truman, H. S., communication regarding national hearing week, 436
Tuberculosis: See also under names of organs and regions, as Tonsils; etc.
and smoking, 442
review of, 226

Tumors: See Fibroma; Hamartoma; Plasmocytoma; Sarcoma; and under names of organs and regions, as Esophagus; Larynx; Lips; Maxillary Sinus; Mouth; Nose; Sinuses, Nasal; Throat; Trachea; etc.
Tuning Forks: See Hearing, tests
Tympanic Membrane: See under Ear

Ulcers: See under names of organs and regions

Van Alyea, O. E.: Irrigation of maxillary sinus by way of middle meatus, 231
Vasomotor System, receptor apparatus of vestibulovasomotor reaction, *257
use and misuse of nasal vasoconstrictor medications, 81
Veins: See Thrombosis
Veintemillas, F.: Postoperative mastoid process, 153
Vertigo, aural; Ménière's famous autopsy and its interpretation, *186
Vestibular Apparatus: See Ear; Labyrinth
Vitamins and eye, ear, nose and throat, 82
diagnosis and treatment of nonsuppurative sinusitis, *198
K; late secondary tonsillar hemorrhage; studies of prothrombin and vitamin K, *14
Vocal Cords: See also Larynx; Voice
Paralysis: See Larynx, paralysis
stripping of, *378
Vocation; vocational rehabilitation for deaf and hard of hearing, *157
Voice: See also Hoarseness; Vocal Cords
anomalies of speech mechanism and associated voice and speech disorders, 227

Wachsberger, A.: Modified traction and fixation splint for fractures of facial bones, *53
Walter, M. M.: Vocational rehabilitation for deaf and hard of hearing, *157
Waltner, J. G.: Development of cochlear aqueduct and round window membrane in human embryo, *239
Labyrinthitis following purulent infection of middle ear; histopathologic studies, *93
Slight operative injuries of stapes; histopathologic study of case, *42
War: See also Aviation and Aviators; Military Medicine; Wounds; etc.
practice of otolaryngology in China in peace and in war, 84
Weber-Rendu-Osler's Disease: See Telangiectasia
Whisper Test: See Hearing, tests
White, J. W.: Penicillin therapy for thrombosis of cavernous sinus in 14 month old child, *147
Windle, W. F.: Alterations in brain due to asphyxiation, 85
Wolff, D.: Histopathology of incus and head of malleus in cases of stapedial ankylosis, *339
Woodruff, G. H.: Massive pharyngeal hemorrhages; report of case, 84
Ossifying fibroma of ethmoid cells and frontal sinus, 306
Wounds: See also Military Medicine; War
reconstructive treatment of gunshot wound of face and neck, *191
Wycis, H. T.: Receptor apparatus of vestibulovasomotor reaction, *257

Zona: See Herpes zoster

THE ARCHIVES OF OTOLARYNGOLOGY is published by the American Medical Association to stimulate research in the field of otology and laryngology and to disseminate knowledge in this department of medicine.

Manuscripts for publication, books for reviews and correspondence relating to the editorial management should be sent to Dr. George M. Coates, Chief Editor, 1721 Pine Street, Philadelphia 3, or to any other member of the Editorial Board. Communications regarding subscriptions, reprints, etc., should be addressed, ARCHIVES OF OTOLARYNGOLOGY, American Medical Association, 535 North Dearborn Street, Chicago 10.

Articles are accepted for publication on condition that they are contributed solely to the ARCHIVES OF OTOLARYNGOLOGY. Manuscripts must be typewritten, preferably double spaced, and the original copy should be submitted. Zinc etchings and halftones will be supplied by the Association when the original illustrations warrant reproduction and when their number is not considered excessive.

Footnotes and bibliographies (the latter are used only in exhaustive reviews of the literature) should conform to the style of the *Quarterly Cumulative Index Medicus*. This requires, in the order given: name of author, title of article and name of periodical, with volume, page, month—day of month if the journal appears weekly—and year.

Matter appearing in the ARCHIVES OF OTOLARYNGOLOGY is covered by copyright, but as a rule no objection will be made to its reproduction in a reputable medical journal if proper credit is given. However, the reproduction for commercial purposes of articles appearing in the ARCHIVES OF OTOLARYNGOLOGY or in any of the other publications issued by the Association will not be permitted.

The ARCHIVES OF OTOLARYNGOLOGY is issued monthly. The annual subscription price (for two volumes) is as follows: domestic, $6.00; Canadian, $6.40; foreign, $7.00, including postage. Single copies are 75 cents, postpaid.

Checks, money orders and drafts should be made payable to the American Medical Association.

OTHER PERIODICAL PUBLICATIONS
of the American Medical Association

THE JOURNAL OF THE AMERICAN MEDICAL ASSOCIATION—Weekly. Covers all the medical sciences and matters of general medical interest. Illustrated. Annual subscription price (three volumes): domestic, $8.00; Canadian, $9.50; foreign, $12.00. Single copies, 25 cents.

ARCHIVES OF INTERNAL MEDICINE—Monthly. Devoted to the publication of advanced original clinical and laboratory investigations in internal medicine. Illustrated. Annual subscription price (two volumes): domestic, $5.00; Canadian, $5.40; foreign, $6.00. Single copies, 75 cents.

AMERICAN JOURNAL OF DISEASES OF CHILDREN—Monthly. Presents pediatrics as a medical science and as a social problem. Includes carefully prepared reviews, based on recent pediatric literature, abstracts from foreign and domestic literature, book reviews, transactions of special societies, etc. Illustrated. Annual subscription price (two volumes): domestic, $8.00; Canadian, $8.40; foreign, $9.50. Single copies, 85 cents.

ARCHIVES OF DERMATOLOGY AND SYPHILOLOGY—Monthly. Devoted to advancing the knowledge of and progress in cutaneous diseases and syphilis. Publishes original contributions and abstracts of the literature on these two subjects, transactions of the important dermatologic societies, book reviews, etc. Illustrated. Annual subscription price (two volumes): domestic, $8.00; Canadian, $8.40; foreign, $9.00. Single copies, 85 cents.

ARCHIVES OF NEUROLOGY AND PSYCHIATRY—Monthly. A medium for the presentation of original articles on nervous and mental diseases, with abstracts from foreign and domestic literature, book reviews, transactions of special societies, etc. Illustrated. Annual subscription price (two volumes): domestic, $8.00; Canadian, $8.40; foreign, $9.50. Single copies, 85 cents.

ARCHIVES OF SURGERY—Monthly. Devoted largely to the investigative and clinical phases of surgery, with monthly reviews on orthopedic and urologic surgery. Well illustrated. Annual subscription price (two volumes): domestic, $8.00; Canadian, $8.40; foreign, $9.00. Single copies, 85 cents, except special numbers.

ARCHIVES OF PATHOLOGY—Monthly. A periodical devoted to the publication of original articles and general reviews in the field of pathology. Illustrated. Annual subscription price (two volumes): domestic, $6.00; Canadian, $6.40; foreign, $7.00. Single copies, 75 cents, except special issues.

ARCHIVES OF OPHTHALMOLOGY—Monthly. Includes original articles on diseases of the eye, abstracts from foreign and domestic literature, book reviews, transactions of special societies, etc. Illustrated. Annual subscription price (two volumes): domestic, $8.00; Canadian, $8.40; foreign, $9.00. Single copies, 85 cents.

WAR MEDICINE—Monthly. Devoted to material on preparedness and scientific advancement in relation to military, naval, public health and allied services. Annual subscription price (two volumes): domestic, $6.00; Canadian, $6.40; foreign, $7.00. Single copies, 75 cents.

QUARTERLY CUMULATIVE INDEX MEDICUS—Quarterly. A complete subject and author index to the worth while current medical literature of the world. Issued four times a year. Second and fourth volumes bound for permanent reference. Subscription price, calendar year: domestic, $12.00; Canadian, $14.00; foreign, $14.00.

AMERICAN MEDICAL ASSOCIATION

535 North Dearborn Street **CHICAGO 10**

CONTENTS

PAGE

HERPES ZOSTER AURIS ("GENICULATE" GANGLIONITIS): REPORT OF EIGHT CASES WITH PHOTOGRAPHS OF THE SO-CALLED SYNDROME OF RAMSAY HUNT. HUGH O'NEILL, M.D., SANTA ANA, CALIF. 309

PENICILLIN THERAPY IN THE PRACTICE OF OTOLARYNGOLOGY. LIEUTENANT COLONEL GILBERT C. STRUBLE, MEDICAL CORPS, ARMY OF THE UNITED STATES 327

HISTOPATHOLOGY OF THE INCUS AND THE HEAD OF THE MALLEUS IN CASES OF STAPEDIAL ANKYLOSIS. JULIUS LEMPERT, M.D., AND DOROTHY WOLFF, PH.D., NEW YORK 339

HYPERPLASTIC SINOPHARYNGOSTOMATITIS: A MANIFESTATION OF BORDERLINE ALLERGY RESULTING IN FETOR EX ORIS, SNORING AND GLOBUS HYSTERICUS. NOAH FOX, M.D., AND ROBERT G. KESEL, D.D.S., CHICAGO 368

PROGNOSIS OF THE RECURRENT NERVE PARALYSIS FOLLOWING THYROIDECTOMY. ALEXANDER F. LASZLO, M.D., AND CHARLES O. FIERTZ, M.D., NEW YORK 372

TREATMENT OF CHRONIC SUPPURATIVE OTITIS MEDIA WITH PENICILLIN. MAJOR JOHN J. CONLEY, MEDICAL CORPS, ARMY OF THE UNITED STATES. 374

STRIPPING OF THE VOCAL CORDS. JOHN M. LORÉ, M.D., NEW YORK..... 378

THE NEGLECTED SEPTAL CARTILAGE GRAFT (WITH EXPERIMENTAL OBSERVATIONS ON THE GROWTH OF HUMAN CARTILAGE GRAFTS). LYNDON A. PEER, M.D., NEWARK, N. J..... 384

NEOPLASMS OF BOTH MAXILLARY SINUSES. MEYER D. BERGER, M.D., BROOKLYN 397

ATROPHIC RHINITIS AND OZENA. WILLIAM M. FITZHUGH JR., M.D., C.M., D.SC. (MED.), SAN FRANCISCO 404

OCCUPATIONAL DEAFNESS, WITH SPECIAL REFERENCE TO CHRONIC OCCUPATIONAL DEAFNESS. ABRAHAM GOLDNER, M.D., NEW YORK.... 407

NONVIRULENT DIPHTHERIA. GORDON F. HARKNESS, M.D., DAVENPORT, IA... 412

CASE REPORTS:

DEEP CELLULITIS OF THE FACE AND NECK—LUDWIG'S ANGINA. MAX KIMBRIG, M.D., HUNTINGTON, N. Y..... 415

THROMBOSIS OF A LATERAL SINUS WITH METASTASIS; PENICILLIN THERAPY; RECOVERY. SAMUEL ROSEN, M.D., NEW YORK..... 417

CLINICAL NOTES; NEW INSTRUMENTS AND TECHNICS:

MAGNETIC AID IN INSERTING AN ESOPHAGEAL STRING. MURDOCK EQUEN, M.D., ATLANTA, GA..... 419

PROGRESS IN OTOLARYNGOLOGY. SUMMARIES OF THE BIBLIOGRAPHIC MATERAL AVAILABLE IN THE FIELD OF OTOLARYNGOLOGY:

TUMORS OF THE NOSE AND THE THROAT. GORDON B. NEW, M.D., AND EDWARD L. FOSS, M.D., ROCHESTER, MINN..... 421

TONSILS AND ADENOIDS. J. DUDLEY SINGLETON, M.D., DALLAS, TEXAS.. 428

CORRESPONDENCE:

NATIONAL HEARING WEEK:

C. STEWART NASH, M.D., PRESIDENT, AMERICAN SOCIETY FOR THE HARD OF HEARING 436

HARRY S. TRUMAN, PRESIDENT OF THE UNITED STATES..... 436

COMMENT BY AMERICAN SOCIETY FOR THE HARD OF HEARING..... 436

ABSTRACTS FROM CURRENT LITERATURE..... 437

NEWS AND COMMENT..... 443

BOOK REVIEWS 443

DIRECTORY 444

GENERAL INDEX 445